LS-24

UNDERSTANDING AND EVALUATING TECHNICAL DATA PRICES

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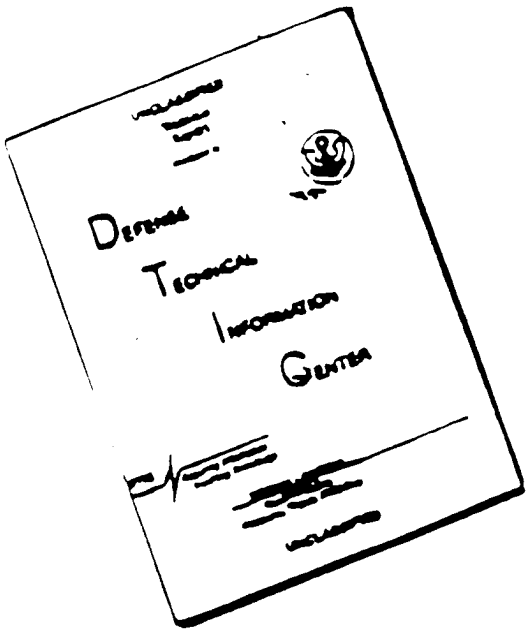

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CHAPTER 7

PRICING OF DATA

A. INTRODUCTION

This part has been prepared to assist students of the Department of Defense Data Management Course PPM 370 in their understanding and evaluation of the complexities involved in pricing contractor acquired data.

The standards shown reflect many years of effort by the Data Management Office of the Army Materiel Command under the guidance of Mr. Vincent F. Mayolo. Hopefully all users of these standards will benefit from his efforts.

Note that "rights in data," is a separate pricing consideration not addressed in this part since it is discussed in Chapter 5A.

Since the basic intent of this part is for educational purposes, the average manhours or "standards" shown are not, at this time, official Air Force or Department of Defense data standards for pricing contractor procured data.

Don't be timid when it comes to learning all the facts leading to the dollar value that the contractor has put in Block 25 of the DD Form 1423 for each data item sequence. Ask and re-ask your procurement contracting officer (PCO) to secure facts, man-hours, degree of difficulty or complexity, and any other details you need before you recommend the contractor's estimated data price for acceptance.

B. PURPOSE

The purpose of this Chapter is to present supplemental guidance for use by pricing analysts, data managers and other individuals, who are concerned with the realism of data price estimates submitted by contractors. It is the PCO's responsibility to secure both a pre-contractual estimated price on each and every data item sequence listed on the CDRL, and a final negotiated contractual price on each and every data item. It is your responsibility to establish credibility in the decision to accept contractor's data prices.

FOREWORD

This document contains the fundamental concepts which can be utilized by data managers, procurement contracting officers, contract administration personnel and all other interested personnel for guidance in the conduct of their data pricing efforts. It identifies tasks that contractors normally perform when responding to a government requirement to provide data. Average manhours to perform each task are specified along with defined relationships of skill levels and degree of complexity assigned to each data preparation task.

This publication is Chapter 7, extracted verbatim, from the text book used in the DOD Data Management Course, PPM 370.

Per 2/22/96

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This publication has been reviewed and approved by competent personnel of this command in accordance with current directives on doctrine, policy, essentiality, propriety, and quality.

The above factors show that the price of data to the government can vary depending upon the degree of sophistication incorporated in the data requirements and the amount of contractor "over-and-above" (see below) effort required to develop and prepare the data.

D. CONTRACTOR PRICE GROUPS "OVER AND ABOVE" THEORY

1. On most contracts the contractor prepares the preliminary design, development, test and production data irrespective of the deliverable data requirements placed on the contract by the government. Since World War II major defense contractors have priced out data preparation efforts in any number of ways. In some instances it was separately costed, in other cases it was included in the burden accounts, or in the contractor's design and engineering efforts. Our current DOD pricing policy is not intended to cause contractors to change existing accounting systems to generate and identify data costs, but rather to furnish the government "estimated (and later negotiated) selling prices" for deliverable data items. Knowing that much of the data required by the government are basically the same as that prepared by the contractor for his own use in satisfying the contract, the DOD in conjunction with Aerospace Industry Associations developed what is known as the "over-and-above" concept. This concept in action requires the contractor to include in his estimated selling price on each specified data item, that portion of the development/preparation data effort expended by him to solely satisfy the government requirement for a deliverable data item.

2. The estimated selling price to the government also includes General and Administrative (G & A), Overhead and the Profit fee. Under the "over-and-above" concept the estimated selling price is contingent on whether or not he had to prepare the data for his own use or solely to meet the government requirements.

3. Current DOD policy identifies four pricing conditions, known as "Price Groups," which the contractor utilizes under the "over-and-above" concept. These "Price Groups" are described as follows:

> GROUP I. Group I contractor effort covers that data which the contractor has to prepare solely to satisfy the government requirement. These type data are not essential to the contractor's performance of the primary contracted effort. Government pays all identifiable costs plus G & A, Overhead and Profit for this group. This group is the most costly to the government. An example of Group I data is Technical Manuals prepared for government use only. (Note: Source material for Technical Manuals are generally Engineering Drawings, the cost of which are priced independently from the selling price for the Technical Manuals.)

GROUP II. Group II covers that data which is essential to the performance of the primary contracted effort but additional "over-and-above" contractor effort is required to conform to Government stated requirements such as special formats, number of copies, etc. Government pays only for that part of the task required in preparing final delivered product plus G & A, Overhead and Profit. Much of the data procured by the government falls in this group. An example would be engineering drawings. The estimated selling price includes the contractor effort expended after engineering and manufacturing information is developed. This price should not include research, design, layout times, etc., and exclude all efforts from other prepared data which serve as the basis for developing design, manufacture, production or test of any end item or component that are to be delivered under the contract.

GROUP III. Group III covers that data which the contractor must develop for his internal use and which requires no substantial change to conform to government requirements with regard to depth of content, format, frequency of submittal, preparation, and quality of data. Government pays only "over-and-above" costs such as reproducing, handling and delivering data plus G & A, overhead and profit for this group. An example would be engineering drawings in company format and drawn to company standards as used in the manufacturer's normal plant functions.

GROUP IV. Group IV contractor effort covers that data which the contractor has developed as part of his commercial business. The government requirement for this data is minimal and the cost is also comparatively minimal, therefore, the data item is coded "No Charge." The use of this group by contractors during weapon systems acquisitions is generally not condoned since it has no application by definition. An example would be a brochure or brief manual developed by the contractor for commercial application.

4. It is mandatory that the contractor assign the proper Group coding to each data item listed on the DD Form 1423. The tasks associated with preparing the data item must be further identified and analyzed as described below.

E. DATA PREPARATION TASKS

Two distinct segments of tasks are required to prepare technical documentation:

1. Preparation Tasks (Technical Skills Required). These tasks include the research, design, drafting, illustrating, writing, typing and reviewing efforts associated with the preparation of technical documentation. These tasks represent between 70% and 80% of the contractor's cost for preparing data. They also increase or decrease depending upon

the technical complexity involved in developing the product. Example: A highly technical, complex electronics drawing containing schematics, advanced mathematical equations requiring the knowledge and experience of an electronic engineer will be more costly than a relatively simple report prepared by a technical writer. The price difference is in the manhours required to do various tasks and the dollar rates applied to the labor involved.

2. Production Tasks. These tasks include materials, printing, handling, inspection, distribution, storage and mailing efforts associated with the preparation of technical documentation. These tasks represent between 20% and 30% of the contractor's cost for preparing data. Costs depend upon such factors as the quality of paper, type of binding, type of cover, foldouts, etc. Example: a required formal format which includes adjusted right margins versus relaxed style; printing on one side of the paper versus printing on both sides; or standard size paper versus legal size. Also the distribution of the data multiple addressees versus limited addressees and daily, weekly, monthly distribution versus quarterly, semi-annual or annual distribution all have a bearing on the costs incurred by the contractor and in turn, the selling price to the government.

F. DATA PRICE ESTIMATING BY CONTRACTORS

1. There are many price estimating methods that contractors utilize to price out data items specified on the DD Form 1423. However, most methods have similar basic structures. Fundamental to each is the need to break down all of the variables in each data item sequence in terms that can be translated into labor hours and material costs. Of importance is the fact that all contractors do not employ the same skill level and pay scale to prepare similar data. Where one company may utilize an engineer for the research task in developing data, another may use a technician of lesser skill.

2. ASPR 3-807.13, "Estimated data prices (DD Form 1423)," states... different offerors may reflect these costs in a different manner for the following reasons:

(i) Differences in business practices in competitive situations.

(ii) Differences in accounting systems among offerors.

(iii) Use of factors or rates on some portion of the data.

(iv) Application of common effort to two or more data items.

(v) Differences in data preparation methods among offerors.

For these and other reasons, data price estimates should not be used for contract pricing purposes without further analysis.

3. Efforts to account for labor and material costs are generally more rigid in the preparation of such significant data as Engineering Drawings, Technical Manuals, Provisioning Documentation, Configuration Management Reports, Specifications and certain studies and reports. These types of data could contain certain contractor efforts that overlap or interface from one data item sequence number to the other and thus could impact the proposed selling price.

G. THREE BASIC ESTIMATING TECHNIQUES

With this bit of introduction a brief examination and discussion of some of the methods utilized by contractors to cost out data and submit an estimated data price to the government follows:

1. The Program Comparison Method

a. Many contractors utilize a program comparison method in determining data prices using many factors of past programs which closely parallel the current proposal. This type of pricing depends upon the close resemblance of the present proposal to the past program. The closer the two programs come to equalling each other in type, complexity and user involvement, the easier the matter of calculating the required effort to price out the data. However, where differences exist in program or in the data requirement the contractor will make adjustments and calculate his estimates based on these adjustments. His price proposal will be based on the efforts he expended on a previous data producing effort, increased or decreased, depending on the results of the comparisons made. When a contractor utilizes this method he considers any differences that exist between the old and new programs such as:

(1) Hardware:

(a) Design characteristics of old and new systems.

(b) Components, parts and the quantity, quality and complexities of each.

(c) Operational scenarios (changes from old to new requirements).

(2) Operation and Maintenance concepts (old/new system).

(3) Production and Quality Control Requirements.

(4) Site of Program Activities

(a) Design)
(b) Test)
(c) Deployment)

When these activities occur in different locations factors such as travel and other expenses must be included in the estimated data costs.

(5) Facilities

(6) Applicable specifications

(7) Maintainability Goals/Requirements

(8) Reliability Goals/Requirements

(9) Supply support for spare/repair parts and levels of established provisioning.

(10) Management systems imposed

b. Under this comparison method, variations in any of the above factors usually influences the amount of effort required to develop the data. Changes in some factors would cause impacts on only a few types of data while changes to other factors would affect almost all types of data being prepared.

c. A case study is offered at this point for the purpose of analyzing data price estimating using the comparison method. Following assumptions are used on the estimate work-up sheet shown in Figure 7-A on page 7 A9.

(1) The contractor has previously prepared similar data for other programs;

(2) He will achieve and maintain an acceptable degree of quality in his data preparation effort.

(3) The data to be prepared is complex.

(4) The contractor's format, and standard size pages are specified.

(5) The data requirements specifies for the contractor to deliver original manuscript only, on a one-time basis, and contains no provisions for updating the data.

(6) Sufficient time is allotted to prepare and deliver the data from the contractor's design facility.

USING THE COMPARISON METHOD
TO ESTIMATE
PRICES OF PREPARING MANUSCRIPTS (TEXT & ILLUSTRATIONS)

TECHNICAL SKILLS REQUIRED	COMPARISON DATA: DATA ITEM SEQUENCE NUMBER	NUMBER OF PAGES	Z FACTOR (%)	ESTIMATED NUMBER OF PAGES IN NEW DOCUMENT	HOURS PER PAGE BY TECH SKILL: I	II	III	TOTAL HOURS FOR DOCUMENT BY TECH SKILL: I	II	III	BASIC HOURLY LABOR RATE 1*	TOTAL DIRECT COST BY TECHNICAL SKILL: I	II	III
	B005													
ENGINEER		120	80	96	1.0	0.5	-	96.0	48.0	-	$12.00	$1152.00	$576.00	-
ENG TECH & EDITOR		120	80	96	0.8	0.5	-	76.8	48.0	-	$ 9.00	$ 681.20	$432.00	-
TECH WRITER		100	80	80	4.0	1.9	-	320.0	152.0	-	$ 7.50	$2400.00	$1140.00	-
ARTIST ILLUST DRAFTSMAN, AND PHOTO-GRAPHERS 2*		20	82	16	11.5	5.5	-	184.0	88.0	-	$ 5.50	$1012.00	$484.00	-
MISC PRODUC-TION SPECIAL-ISTS 3*		120	80	96	5.1	5.1	5.1	489.6	489.6	489.6	$ 4.50	$2203.20	$2203.20	$2203.20
TOTAL DIRECT LABOR												$7448.40	$4835.20	$2203.20
GENERAL AND ADMINISTRATIVE (15% OF TOTAL DIRECT LABOR COST)												$1117.26	$ 725.28	$ 330.48
OVERHEAD (127% OF TOTAL DIRECT LABOR COST)												$9459.47	$6140.70	$2798.06
PROFIT (7% OF DIRECT LABOR COST + GENERAL & ADMINISTRATIVE + PROFIT)												$1261.67	$ 819.08	$ 373.22
TOTAL ESTIMATED DATA PRICE												19,286.80	12,620.26	5,704.90

1* BASIC HOURLY RATES WILL VARY OVER TIME, DUE TO GEOGRAPHIC LOCATION, AND FROM ONE INDUSTRY TO ANOTHER
2* THESE AVERAGE HOURS INCLUDE LAYOUT AND PREPARATION OF CAMERA READY ILLUSTRATIONS
3** TYPISTS, PHOTO PROCESSING & PRINTING SKILLS ARE INCLUDED UNDER THIS HEADING

Figure 7-A

The case study shown on Figure 7-A is hypothetical. The intent is to show the breakdown of separate data price estimates by each of the major Groups discussed earlier, by utilizing the comparison method. A contractor should code this effort as either I, II or III. He can assign only one code per data item in block #25 of DD Form 1423. The illustrated case shown would be properly coded as Group I, assuming that it is a technical manual being prepared to satisfy the Government requirements.

In the way of further explanation in the illustration, the contractor judged that approximately 80% of the new document to be prepared closely paralleled one prepared for a previous program (reference the Z factor column). Note that the average hours per page, by the various skills required, decreased based on the contractor's judgement of the "over-and-above" effort required. The base rates used in the three groups were as follows:

GROUP I. Entire effort to satisfy government requirement, all costs considered "over-and-above."

Research----An Engineer researched the previous document and came up with the comparison factor, validated the information, made notes, reviewed and rendered technical direction as required. To perform these functions required approximately 1.0 hours per page. An engineer's base hourly rate is $12.00.

Review------This task was performed by an Engineering Assistant who served as editor, quality control specialist, made limited calculations, sketched and technically analyzed. This required approximately .8 hours per page at his base hourly rate of $9.00.

Writing-----A Technical Writer spends approximately 4.0 hours per page doing research, planning, scheduling, writing, making determinations and selection of the illustrative material, performing liaison, validation, etc. His base hourly rate is $7.50.

Art---------An Engineering Draftsman/Designer makes layouts, sketches, illustrations, detailing, and prepares and validates the art work required. His time was calculated at 11.5 hours per page at a base hourly rate of $5.50.

Production--This task includes the clerical effort of composing and typing and the original and subsequent revisions of certain pages. The cost of materials was also included here. Normally such costs as printing, collating, binding, etc., are also included here. In this instance however, the Government requirement called for preparation and delivery of original manuscript only. The hourly rate applied here was a composite of $4.50 applied to the average of 5.1 production hours per page.

GROUP II. Contractor had to prepare for his own use, but format and content changes were imposed by the government requirement.

In this instance all but the production time has been cut by approximately 50%. Costs shown represent the "over-and-above" chargeable to the government. The portions of the costs which were cut are probably charged off to the design function of producing the hardware, since the contractor had to prepare the basic data for his own use. The Production Costs remain the same as Group I.

GROUP III. Contractor had to prepare for his own use. The government will accept "as is."

For GROUP III all but the production time has been charged off elsewhere. The only "over-and-above" direct costs chargeable to the government are those associated with the "production tasks" described elsewhere on this page.

The General and Administrative (G & A) overhead and profit factors have been applied as appropriate for all three groups of effort. It should be noted that the cited illustration of the comparison method represents a large Aerospace Company. The skill levels utilized here may not necessarily hold true for a smaller company, where for instance, an engineer or engineering assistant could well perform the research, review and drafting functions.

d. While the illustration used in Figure 7-A was for a single data item, the comparison method when utilized is generally applied to all the major cost requirements on the contract. All such requirements are placed on a worksheet similar to Figure 7-A and a comparison factor is determined for each item before final consolidation on a DD Form 633. The G & A overhead and profit factors are applied only once to the total package. This same program comparison principle may be used to estimate data cost on an even grosser basis by consolidating a number of related requirements. On a collective basis,

average work rates for research, writing, art and production are used to simplify the computation. However, when more and more data requirements are considered collectively, the estimated data prices are likely to decrease in credibility. Some contractors make computations based on gross averages for the purpose of furnishing data price proposals. Others use the gross estimating method to cross-check estimates derived by more precise methods. The comparison method of determining estimated data prices is used in most cost plus fixed fee contracts.

2. The Task Analysis Method. Another of the methods used in computing data price estimates is the one of breaking down each requirement into tasks analyzing each of the preparation tasks required to provide the data. This method of estimating is the most accurate and for this reason it is generally used on fixed price and other incentive type contracts.

a. The initial step in this method is to prepare a breakdown of each individual category of effort on the program. Then each category is further broken down to tasks which are required to meet the program objectives. Once the tasks are identified, the manhours of effort and materials required to satisfy each task are estimated. A summation of these estimates provides a base figure. Due to the high degree of detail this incremental estimating is the most accurate method of data pricing and is ideal for internal budget, schedule, and manhour control and management.

b. Under this method, each data item sequence and its referenced specifications or standards are studied, first, independently and then again to ascertain redundancy and degree of overlap. From these studies a task breakdown matrix is developed, to define the details accorded each task, and the assigned complexity and pricing group of each task to be performed. These tasks are selected on the basis of the difficulty of preparation, and each is defined enough to permit an accurate evaluation in terms of manhours for each labor skill involved. Art work, for instance, is estimated in terms of numbers and types of illustrations and the complexities involved in producing each type. Manhours are estimated by people experienced in these skills. Production costs are similarly computed. This method can be utilized for most types of data. For engineering drawings, as an example, a breakdown in terms of the various tasks to be performed is first established. Task segments such as rough design layouts, lettering and dimensioning, and final detail design layouts are identified with labor rates applied to the estimated manhours estimated to perform each of the various tasks.

c. The task analysis method differs from the program comparison method in that a detailed analysis is made of the separate tasks required to develop and produce each separate data line item. By so doing, it is

possible to develop more accurate and thus more credible data price estimates. Under the program comparison method the required tasks levels are not identified as accurately as under the task analysis method. The final computation of the task analysis method also includes standard cost factors for G & A, Overhead and Profit. Under this method experience in preparing similar data on a previous program is not necessary.

3. Levels of Effort Method. Another method used by contractors for pricing a data program is to estimate the types and quantities of skills that will be needed by comparing the new program with one that has been completed, not necessarily of the same type. The differences between the programs are analyzed, and then a rule-of-thumb (Heuristic) technique is applied to determine comparative degrees of activities involved in the new program. The Levels of Effort Method is not really distinctive but is a combination of the program comparison and task analysis methods inasmuch as some estimates of detail work are required, plus comparisons must be made with other programs. The Levels of Effort is also used by contractors to gross check on the computations derived by the other methods.

a. In establishing levels of effort with which to make valid comparisons, it is necessary to reduce both the old and new programs into comparative segments. This involves splitting each program into common functional activities. Groups of personnel needed for the new program, in terms of numbers and skills, are then determined by rule-of-thumb comparison with what was required on the completed program. Comparable levels of activity must be determined by analysis of the statement of work (or comparable requirements definition document such as work specification, engineering exhibit, etc.).

(1) For example, if analysis shows that one group of draftsmen produced a number of drawings disclosing the design and production aspects of known technical or mechanical equipments; a similar group of draftsmen for the new program could serve as a standard to estimate the relative amounts of work. The new group is then planned in terms of skill level and manhours on the basis of the comparison program.

b. Cost factors for printing, validating and verifying, correcting and updating were not broken out in the other two data cost estimating methods discussed. These considerations can be readily calculated by using the comparison methods of estimating. The level of effort estimated for their activation can then be included with those for basic data preparation. To arrive at cost data, the same methods described can be applied to the total hours estimated for each labor category, and direct costs extended to reflect Overhead, G & A and profit.

H. OTHER CONTRACTOR DATA PRICING CONSIDERATIONS

1. Printing and Distribution. As mentioned above, the costs for printing and distribution are relatively small in comparison to other data development costs. However, these costs must be included in the contractor's estimated data costs shown against each data sequence number listed on the DD Form 1423. (Printing of Technical Manuals excepted since these are printed and distributed by the Government Printing Office.)

a. Printing costs depend upon the method of printing, the type of paper used, the binding process and covers if requred, and the number of copies. The method of printing and binding is specified in the contract and contractors include prices for each possible operation that may be encountered. Rates for different quantities and types are established on sliding scales. As quantities increase, costs per unit quantity are less. This is because in small quantities the major cost involves setting up the run. Once the printing copy is set, additional quantities can be handled for little more than paper costs and press time. Different prices are included for the different page sizes anticipated, different types of printing processes, color overlays, the drilling of holes and adding posts or staples as binders, stitching, wrapping, and adding the covers if so specified by the DD Form 1664 on large volume printing requirements such as Technical Manuals. The DD Form 1423 requires only a camera ready original from the contractor.

b. Contractor distribution costs are similarly specified, based upon distances, methods of shipment, methods of packaging, and weight. The DD Form 1423 specifies all addressees.

I. CONTRACTOR COSTS FOR VALIDATING AND VERIFYING DATA

Contractor pricing for validating data consider the following aspects:

1. Methods to be used in correcting and approving data for release.

2. Time allotted to perform the task (time constraints are very costly).

3. The number of times and the volume of data to be validated.

4. Number of people required and skill types.

5. Type of records and schedules to be established/maintained.

6. Travel and other related expenses involved.

Once the contractor establishes and identifies these requirements the pricing effort becomes routine. Rates for labor and materials are established and applied as necessary. Contingency costs are generally included for rechecking data, since test programs and operational use of the equipment generally reveals the need for further improvements.

J. CONTRACTOR COSTS FOR UPDATING DATA

1. Design/Hardware improvements impose the need for contractors to change or correct their initial data effort for the government. Most data are changed or revised to correct deficiencies, to add data, to introduce new methods, or to cover design changes that have been made to equipments, or to the computer programs (software). Contractors use one of the three pricing methods just explained to estimate effort, and the cost of revised data is based on reliable estimates of the number of changes that are required and the means by which these changes will be accomplished.

2. During development, test, and production of a major weapon system contractor personnel assume that every sheet of data, for major systems, will require a minimum of two changes or revisions during the first year of use, and they establish price estimates accordingly. The rate of change then drops in succeeding years. Based on this assumption then, contractors cost to update data is usually derived through the use of percentage estimates. This average percent of change over a given time period is established and used for gross price estimating until an analysis and cost determination is made for each discrete change. After the updating labor hours have been determined by whatever pricing method the contractor utilizes, he then uses these hours to establish his cost for the updating effort.

3. In the way of illustration, assume a 100% change with a 50% decrease in the contractor preparation effort to process the change as opposed to the original preparation effort of that data. Contractor labor hours are computed by multiplying the original preparation hours by 100% and 50% (100 X .50 = 50). In this instance the initial year of data updating preparation effort would be priced at 50% of the original effort for skills required to perform the various tasks involved. If a 200% change with a 50% decrease is estimated to prepare changes, the price of updating would closely parallel the cost of the original data.

4. Design changes to the equipment (hardware) or to the computer programming (software) have the most significant impact on the contractor's data pricing effort. It is very difficult for a contractor to accurately predict the extent of design changes that will be made on a particular system or computer program over a given period of time, especially if he

has not previously manufactured similar hardware or developed similar software. These changes generally occur after testing, or after the weapon system has been deployed. As part of each Engineering Change Proposal the contractor estimated changes to the data are usually lumped together with engineering estimates. Accordingly, the impact on data changes cannot be properly assessed until discrete engineering design changes are identified. Once the contractor has completed a given change he then spreads out his data costs as discussed under basic data development effort. Some contractors may opt not to shred out costs to revise data, and just include these data revision costs in the total ECP price. If provisions are included in the basic contract covering some design changes, the cost to revise data may be included in the original proposal. "Minor" data changes allowable under the terms of the contract should not result in additional data costs to the government.

K. SPECIAL DATA CONTRACTS

1. Separate contracts are negotiated specifically for the delivery of certain technical data. An example of this would be "call contracts" in support of modification, instructions, and kits. In cases where detailed data requirements cannot be readily established by the government, a "call contract" is generally the most logical for procuring data from both the viewpoints of the government and the data preparation contractor. Depending on the circumstance, "call contracts" for data (i.e., in support of modification kits) generally are for the updating of maintenance documentation. The main advantage is that the possibility of incurring losses by either party due to inaccurate forecasts of the data requirements or prices is minimized.

2. During the period of negotiation both the data preparation contractor and government agree on the types of work and data products that will be covered, and mutually negotiate the prices on a unit and lot basis. The contractual instrument is then drawn up with some amount of leeway allotted in the areas of services, materials, and generally costs. The government is protected by the fact that it is bound in no way to issue calls and has the prerogative of screening the contractor's proposal prior to making any decisions. The contractor, in turn, is afforded the opportunity to alter his price within justifiable boundary conditions specified in the basic contract as a protective measure. Once the data preparation contractor accepts a call contract, it remains only to apply simple pricing factors, using the established restraints of the contract on each call, since the basic pattern has already been established. The government generally assigns funds, within specified boundaries, for a given period, normally a fiscal year.

3. In some cases the preferred method of handling follow-on programs of this nature is to have one "call contract" for maintenance instructions (i.e., in support of modification kits) and another "call contract" for data revisions. The reason for this is that data revisions can't be priced realistically, or the actual preparation effort defined and started until the engineering design is close to completion. Generally the government wishes to improve the deployed system or equipment as quickly as possible, but at the same time needs to insure that all allotted funds are expended within the given fiscal year.

L. PRIME CONTRACTORS SUBCONTRACTING FOR DATA

1. The government usually awards large system or equipment contracts to major prime contractors or groups of associate contractors. One of the associates is usually assigned the integration responsibility for the total system. These prime contractors can be referred to as "Big Business." Because of the government policy to maintain an economic balance between "Big" and "Small" businesses, terms of most large contracts that exceed designated dollar amounts stipulate that a certain percentage of the contract must be shared with small business. Accordingly, in large system programs, it is often convenient for many of the technical data requirements to be subcontracted, and it is becoming more of a common practice to do so. One strong reason for this is the fact that processing final technical data is highly specialized work that reaches a manpower peak very late in the program.

2. Because of schedule impacts the prime may not be able to meet the data requirements delivery schedule without outside help. Also, as mentioned before, if the basic contract contains a small business clause the prime may have to subcontract for data in order to fully satisfy this clause.

3. Integral to establishing data costs are the average wages paid to workers in the various labor categories utilized by the contractor to prepare data, and the particular rates applied within the company for its Overhead and General and Administrative (G & A) expense. While the direct manhours remain relatively constant for similar data preparation task efforts, labor rates for specific categories of skilled or professional talent may vary extensively between one company and the next, and from one industry to another. Accordingly, the final price proposal for a data item depends largely upon wage and overhead factors. (Note: Many companies specializing in development programs, the overhead rate often exceeds 100% of the direct labor costs plus the G & A which runs from 10 to 20% in the average company.) In today's economy, labor and overhead rates vary depending upon the upward and downward trends of the economic cycle and affects of demand. Thus, a contractor's proposed data price, developed utilizing one of the three methods discussed, will probably be based on forecasted rates

expected during the period of time the actual work is to be performed, and will include the percentage of profit applicable to the specific contract.

M. The chief problem with data pricing today is the lack of interest and knowledge of data on the part of most Procuring Contracting Officers! They flat do not want to take the time and energy to concentrate on a commodity that only represents 2-5 percent of the total contract price. Little do most of them understand that the data "bite" grows to 9-30 percent on every repair or spare item that's procured later in the operational phase of a weapon's life cycle. Most of the PCOs cannot believe that they, in their complacence ignorance of a dynamic turn of political and military upheaval, are most likely buying data ultimately destined for a friendly foreign country as part of their purchased security assistance package. Much could be written about the tightening of PCO responsibilities to effectively close the many very obvious holes in current data package acquisitions; however, until the mold from which present PCOs are cast has been reshaped to include concern over the "total" contract, those words would be to no avail. Estimates of DOD data acquisitions usually start at $2 billion a year, these estimates are about 1/2 to 1/3 of the actual annual costs when one includes software acquisitions which are by ASPR now procured under the normal DD Form 1423 procedures. With these magnitudes of DOD dollars being invested yearly in data and considering the host of highly desirable alternative investments that DOD could make with those data dollars, it is strongly recommended that all persons, government and industry alike, rededicate themselves to performing a highly professional, thoroughly proficient analysis on each and every data item sequence number specified on the DD Form 1423. To that end this chapter is already dedicated, with the remaining pages containing an uncomplicated price estimating form designed to openly display all factors leading up to an estimated price for the subject data item sequence number. Also contained are the previously mentioned Army collected average manhours per data related task. Arrangement of the subsequent pages is thus:

Appendix A. Data Estimating Form PPM 370 with total information for completion.

Appendix B. Average Manhours to Complete Engineering Drawings.

Appendix C. Average Manhours to Complete Technical Manuals.

Appendix D. Average Manhours to Complete Provisioning Documentation.

Addendix E. Average Manhours to Complete Specifications.

Appendix F. Average Manhours to Complete Plans.

Appendix G. Average Manhours to Complete Reports.

N. Now that you have all of the theories and Blue Sky that allows you to solidly capture the data pricing perspective within the theater of your mind, proceed confidently that many megabuck savings are about to happen. Use the average manhour tables judiously and only the best can come of it--for you and your contractor. Remember, data and data pricing are not yet finite sciences but with your help they may be someday. Meanwhile the average manhours contained in the attached appendices will provide a place from which to negotiate.

APPENDIX A

CONTRACT NO. _____ CLIN. _____ DID NO. _____
DATE OF CONTRACT _____ PRICE GROUP — SEQ NO. _____

CONTRACT PRICING PROPOSAL FOR DATA | FORM APPROVED OMB NO.

NAME OF OFFEROR
HOME OFFICE ADDRESS | PRIME / SUB | MAJOR SYSTEM

DIVISION/LOCATION WHERE WORK IS TO BE PERFORMED

A. TOTAL COST-PROPOSAL QUOTE FOR THIS SEQUENCE NUMBER $ _____

CONTRACTOR CERTIFICATION

I CERTIFY THAT THIS PROPOSAL IS CORRECT TO THE BEST OF MY KNOWLEDGE AND THAT THE PRICES QUOTED HEREON ARE NOT DUPLICATED IN ANY OTHER SECTION OF THIS CONTRACT RESPONSE.

COST PROPOSAL	PRIME	SUBS
TOTAL DATA COST		
OVERHEAD		
G & A		
PROFIT/FEE		
OTHER		
TOTAL-PROPOSAL QUOTE	$	

TYPED NAME AND TITLE | SIGNATURE | DATE

B.	TEXT		DRAWINGS		FOLDOUTS		ART		PHOTO		COMPUTER INPUT/OUTPUT		TOTAL QTY EA SUBM
ESTIMATED UNITS	SIZE	QTY	SIZE	QTY	SIZE	QTY	SIZE	QTY	SIZE	QTY	SIZE	QTY	
NEW													
REVISED													
UNCHANGED													
TOTALS													

C. DIRECT MANHOURS BY CATEGORY WITH COST FACTORS

	ENG	ASST	WRITER	EDITOR	ILLUST.	CHECKER	CLERICAL	PROG.	TOTAL
NO. OF HOURS									
RATE PER HOUR									
TOTAL COST	$	$	$	$	$	$	$	$	$

D. MACHINE TIME EXPENSES

	NO.	HOURS	RATE	TOTAL
KEYPUNCH			$	$
TABULATOR			$	$
PRINTER			$	$
OTHER			$	$
COMPUTER			$	$
RENTAL EQUIP			$	$
TOTAL			$	$

E. MATERIAL & SERVICE EXPENSES

TYPE	COST
	$
	$
	$
	$

F. TRAVEL & SUBSISTENCE EXPENSES

NO. OF TRIPS				
NO. OF DAYS				
NO. OF PEOPLE				

FROM _____ TO _____

G. REPRODUCTION EXPENSES

TYPE OF REPRODUCTION | NO. OF COPIES

	QTY	COST
TEXT		$
HALFTONES		$
ART		$
FOLDOUTS		$
PHOTO		$
COVERS		$
OTHER		$

	COST
BINDING	$
PKG	$
SHIP	$
TOTAL REPRO COST	$ _____

PROPOSED FORM PPM 370

TO BE PRINTED ON BACK OF FORM

INSTRUCTIONS TO OFFERORS

1. The purpose of this form is to provide a standard format by which the offeror submits to the Government a summary of incurred and estimated costs (and attached supporting information where appropriate) suitable for detailed review and analysis. Prior to the award of a contract resulting from this proposal the offeror shall, under the conditions stated in ASPR 3-807.3, be required to submit a Certificate of Current Cost or Pricing Data (see ASPR 3-807.3).

2. As part of the specific information required by this form, the offeror must submit with this form, and clearly identify as such, cost or pricing data, that is, data which is verifiable and factual and otherwise as defined in ASPR 3-807.3. In addition, he must submit with this form any information reasonably required to explain the offeror's estimating process, including:

- the judgmental factors applied and the mathematical or other methods used in the estimate including those used in projecting from known data, and;
- the contingencies used by the offeror in his proposed price.

3. Attach separate pages, if necessary, and identify the specific entry on the form, in which the information supporting or otherwise relating to the cost element may be found. When attachment of supporting cost or pricing data to this form is impracticable, the data will be specifically identified and described (with schedules as appropriate), and made available to the Contracting Officer or his representative upon request.

4. This form will be completed and submitted without change, regardless of where contractors choose to include data costs in their accounting structures, (e.g., overhead, in the cost of hardware, etc.).

IFB/RFP NO._____ PRICE GROUP _____ DOD NO. _____
DATE OF IFB/RFP SEQ NO. _____

PRICING PROPOSAL FOR DATA		FORM APPROVED OMB NO.
NAME OF OFFEROR HOME OFFICE ADDRESS	PRIME SUB	MAJOR SYSTEM

DIVISION/LOCATION WHERE WORK IS TO BE PERFORMED

TOTAL COST-PROPOSAL QUOTE FOR THIS SEQUENCE NUMBER $_____	COST PROPOSAL	PRIME	SUBS
A. CONTRACTOR CERTIFICATION	TOTAL DATA COST	_____	_____
I CERTIFY THAT THIS PROPOSAL IS CORRECT TO THE BEST OF MY KNOWLEDGE AND THAT THE PRICE QUOTED HEREON ARE NOT DUPLICATED IN ANY OTHER SECTION OF THIS IFB/RFP RESPONSE.	OVERHEAD (%)	_____	_____
	G & A (%)	_____	_____
	PROFIT FEE (%)	_____	_____
	OTHER (AS REQUIRED)	_____	_____
	TOTAL-PROPOSAL QUOTE	$_____	

TYPED NAME AND TITLE	SIGNATURE	DATE

INSTRUCTIONS FOR COMPLETING HEADER INFORMATION

- IFB/RFP Number: Enter the appropriate IFB/RFP number under which the data is required. Example: M00027-75-C-0055 or N00024-70-C-0275.

- Date of IFP/RFP: Enter the effective date as stated on the IFB/RFP. Example: 77 Jan 31 or 78 Feb 03.

- Price Group: Enter one appropriate price group designator (I, II, or III) as currently defined in Armed Services Procurement Manual Number 1 followed with one of the following suffixes to indicate degree of complexity assigned to the Data Item Description herein priced; Simple (S), Average (A), Complex (C). Example: IIA, IC, IIIS

- Data Item Description (DID) Number: Enter the appropriate data item description number from the DD Form 1664. Example: S-4851 or T-3718/T-119-2.

- Sequence Number: Enter the matching sequence number from the DD Form 1423. Example: A005 or B001.

- Name of Offeror: Enter the name of the contractor responsible for preparing the data listed in the header. Example: Lockheed Aircraft Corporation (Lockheed Georgia Company).

- Home Office Address: Enter the corporate office address of the offeror. Example: 86 South Cobb Drive, Marietta, Georgia 30063.

- Prime/Subcontractor: Circle the appropriate preparer of the Data Item Description and related information.

- Major System: If known, enter the weapon system designator and/or the government assigned nomenclature of the end item of which this Data Item Description is a part. Example: A-10A, F-16/APQ-156, AN/ARC-54.

- Division/Location Where Work is to be Performed: Enter the address at which the data package will be prepared. Example: Data Systems Division, 8000 Woodley Avenue, Van Nuys, CA 92701.

- Total Cost-Proposal Quote For This Sequence Number: Enter the total dollar amount that this Data Item Description was estimated to cost and as displayed under Part II, Section E. Example: $26,556.00.

INSTRUCTIONS FOR COMPLETING PART A:

- Contractor Certification: Authenication of the cost factors and other related information will be evidenced by the typed name and title, the signature of the authorized contractor representative and the date of the certification signature.

INSTRUCTIONS FOR COMPLETING COST PROPOSAL SECTION:

- Cost Proposal: Enter appropriate cost factors in the specified headings insuring that the dollar amount shown as the Total-Proposal Quote is the summation of all entered cost factors and is identical to the total described immediately above.

B	TEXT		DRAWINGS		FOLD-OUTS		ART		PHOTO		COMPUTER INPUT/OUTPUT		TOTAL QTY EACH SUBMITTAL
ESTIMATED UNITS	SIZE	QTY	SIZE	QTY	SIZE	QTY	SIZE	QTY	SIZE	QTY	SIZE	QTY	
NEW													
REVISED													
UNCHANGED													
TOTALS													

IV. INSTRUCTIONS FOR COMPLETING PART B :

This part indicates sizes and quantities of the various data media. Entries will be made under each heading, i.e., complete where applicable with appropriate information and with N/A where the heading does not relate to the Data Item Description defined. Should the heading be applicable but the information required to complete the heading is not available enter UNK in those headings involved.

C DIRECT MANHOURS BY CATEGORY WITH COST FACTORS									
	ENG	ASST	WRITER	EDITOR	ILLUST.	CHECKER	CLERICAL	PROG.	TOTAL
NO. OF HOURS									
RATE PER HOUR									
TOTAL COST	$	$	$	$	$	$	$	$	$

V. INSTRUCTIONS FOR COMPLETING PART C:

Entries under the specified headings will be made where the requested information is appropriate and available, N/A where the information is not appropriate, and UNK where the information is appropriate but not available. Should data specialists other than those indicated be involved in the preparation of this Data Item Description enter *** in the total cost heading and submit the cost data on the additional specialist as an attachment to this form indicating that specialist's involved manhours, rate(s) without overhead, G/A, and profit, and then a grand total for Part D.

D MACHINE TIME EXPENSES

KEYPUNCH	NO.	HOURS	RATE	TOTAL
TABULATOR			$	$
PRINTER			$	$
OTHER			$	$
COMPUTER			$	$
RENTAL EQUIP			$	$
TOTAL			$	$

VI. INSTRUCTIONS FOR COMPLETING PART D :

Entries under the specified headings will be made where the requested information is appropriate and available, N/A where the information is not appropriate, and UNK where the information is appropriate but not available.

F. TRAVEL & SUBSISTENCE EXPENSES

		TRAVEL COST	PER DIEM	TOTAL COST
NO. OF TRIPS		$	$	$
NO. OF DAYS		$	$	$
NO. OF PEOPLE		$	$	$

FROM: TO:

VII. INSTRUCTIONS FOR COMPLETING PART F :

Trips may be required by contractor personnel during the preparation of this Data Item Description for the purpose of gathering research information, test data and in the case of preparing software programs to gain access and utilization of the dominant equipment or system. Estimates as to the number of contractor personnel required to travel and all of their related expenses will be summarized in this part. In addition the contractor will submit an attachment identifying each TO and FROM destination plus all other substantiating cost backup information on each proposed trip.

E. MATERIAL & SERVICE EXPENSES

TYPE	COST
	$
	$
	$
	$

X. INSTRUCTIONS FOR COMPLETING PART E:

Specialized materials or services required in the preparation of this Data Item Description will be identified in this part by type and cost.

G. REPRODUCTION EXPENSES

TYPE OF REPRODUCTION _____ NO. OF COPIES _____

	QTY	COST
TEXT		$
HALFTONES		$
ART		$
FOLDOUTS		$
PHOTO		$
COVERS		$
OTHER		$

	COST
BINDING	$
PKG	$
SHIP	$
TOTAL REPRO COST	$ _____

IX. INSTRUCTIONS FOR COMPLETING PART G:

Enter the type of reproduction, such as Xerox, microform[1] and others, with a corresponding entry indicating the number of copies anticipated for each submission and the cost for each category listed such as text, halftones, foldouts and others. Binding, packaging and shipping costs will be broken out under their respective headings and will be a component of the total reproduction cost. Enter N/A under any heading not applicable and UNK under any heading where the information is appropriate but not available.

[1]Generic term which includes microfiche and microfilm.

APPENDIX B

ENGINEERING DRAWINGS

A. BACKGROUND

1. If you are experienced in the preparation and release to production of engineering drawings, skip to Section B.

2. One of the basic steps in the design and production of an end item is to "think" the design into a rough sketch, then from the rough sketch to a more elaborate sketch that portrays the total attributes of a desirable contract end-item. These sketches would not be to any scale but would reflect relationships and proportions. It would also list notes indicating items or components found in a vendor's technical brochure and thought to possess required characteristics needed to satisfy contractual specifications. From this sketch would come other sketches isolating such design attributes as electrical inputs, dissimilar material reactions power requirements plus any safety devices deemed necessary. Tentative installation of the item into the next higher assembly is also sketched so that the final environmental characteristics can be identified and individually and collectively evaluated and satisfied. From this genesis of preliminary design sketches comes a myriad of detailed engineering drawings.

Final, to-scale mechanical drawings are prepared on each and every component of the now agreed to final design as depicted on the rough sketches. Those components which are small in size are drawn on "A" size drawings. Often the complexity of a relatively small component dictates that its size in relation to its degree of complexity must be magnified in order to eliminate or reduce the possibility of misunderstanding of that high degree of complexity by any of the involved specialists that have to do something with or to the depicted component, as it is transformed from a line on a drawing to a finite form fabricated from a specific material. In addition to insuring clarity of processing to each component, engineering drawings define all mating and assembly details ultimately ending up with comprehensive definition of the top assembly or the contract end item.

There are no rules-of-thumb as to the number of detail drawings that a top level assembly will generate. The lead design engineer, in conjunction with his lead draftsman, will estimate the breakdown sequences during preliminary design planning. This sequencing will vary dependent upon the experiences of those doing the planning.

3. Each and every engineering drawing receives a minimum of two 100% inspections after the draftsman deems it complete. First a set of copies are made for the engineering checker.[1] The type of reproduction

[1]For scorekeeping purposes, this is the first total reproduction of each drawing.

may vary contingent upon the nature of the original drawing. A dimensioned drawing can be reproduced by the blueprint method which is a white line on a blue background accomplished using a liquid developer, or any acceptable reproduction technique for that matter. An undimensioned drawing where the depicted lines are to be used as the actual cutting pattern must not be reproduced by the blueprint process due to possible distortion, but must be reproduced using the Ozalid technique which is accomplished using essentially a dry process to transfer images from the original to the copy.

The engineering checker or just checker as he is known evaluates the set of reproductions to determine if in his opinion the designed item meets the intent of the contract requirements; if all necessary producibility information is presented such as dimensions, appropriate tolerances, material and finish specifications and a logical, readily recognizable tie together with all related segments and/or next higher and lower assemblies. Omissions, comissions and recommended revisions are marked on the set of prints. These marked up prints are then given back to the draftsman who initially drafted the design details for correction of the original drawings. After the original drawings have incorporated the checker's recommended revisions another set of prints[2] are obtained for the purpose of allowing the checker to double-check all of his recommended revisions as well as providing a set for either the project engineer to analyze or in some organizations the prints would go to a production specialist for his inspection and approval as being ready for manufacture on either the parent company machines and equipment or on another manufacturer's equipment should the decision be made to subcontract selective items. Revisions are again marked on this the second set of prints and again returned to the design and drafting organization so they can bring the originals up to the point of being released for production.

4. Now let's see what we know so far. First, after much research and considerations of all kinds, preliminary rough sketches are prepared showing the general overall attributes of the desired end item. These sketches or series of sketches are generally prepared by or under the direct guidance of the project engineer or lead designer. These sketches are usually not kept or maintained once the detail engineering drawings have been completed and received release for production or in other words made available to the person who is actually going to produce the item on the print. Next, the detail drawings and all assembly drawings are prepared. These drawings are generally prepared by a lead design draftsman or just "detailers" as they are known in the trade. When a particular full set of original drawings are finished, they are reproduced as previously discussed with the original drawings going into the drawing vault or stacks of flat storage drawers with the reproductions (copies) going to the checker. During the design and development of a major weapon system, thousands and hundreds of thousands of drawings may be prepared. A control function must be established to continuously inventory, transfer, retrieve, reproduce, refile, etc., the original

[2]Set number 2

drawings and their reproductions. Without such a function sheer chaos would ensue with no one knowing the status or whereabouts of any drawing. Generally, a "library card" or sign-in sign-out routine is used so that the control organization knows exactly who has the original drawings or prints at all times. This control procedure helps to curtail clandestine disclosure of the technical content contained on the drawings. Automated lists of the many assemblies, subassemblies, and detail drawings are usually prepared as an aid to the control function. Upon receipt of the checker's recommended revisions the original drawings which now contain officially assigned company drawing numbers are "checked-out" of the vault by the draftsman who is assigned to reconcile the original drawings and the checker's revisions. Upon completion of the necessary reconciliation a second full set of reproductions are made for the production specialist and the originals returned to the vault. This entire loop of activities are repeated for the production specialist's review and approval. After the second reconciliation and full reproduction of the total number of prints that may be required to effectuate manufacture, the original drawings are put back into the vault to await subsequent changes due to conditions found during the testing or operation of the contracted end item.

5. There are two reasons behind this painstaking amount of detail that goes on prior to a production or fabrication of an end item. First it is desired that an understanding and appreciation now exists as to the "step-by-step" generation of an engineering drawing. It is also hoped that a sense of appreciation is developed for the amount of contractor's effort and resources expended, and thus a better comprehension of the "why" behind the engineering drawing preparation manhours that will follow in this appendix.

6. Scene 2 takes us to the point where the prints representing the produced parts are now needed at the Physical Configuration Audit (PCA).[3] This PCA is a formal agreement by representatives of a DOD agency that the hardware that was produced, is in fact, identical to the drawings from which the hardware was allegedly produced. This approval of both the produced hardware and the engineering drawings used to produce the hardware is the "green light" for full production of the contracted quantity of end items. This third check on the engineering drawings by technical specialists is performed in the interest of assuring (but not quite guaranteeing) that all subsequently produced items would be identical to the first item produced. This assurance is the essence of configuration management (see Chapter 5C).

7. The next scene is one where the hand is quicker than the words written on the CDRL. Read carefully this could happen to you! As the finished products are put through rigorous testing and then exposed to

[3]See Chapter 5C

the hard cruel operational environment, changes evolve and are recommended for some of the components. These recommended changes can come from either the procuring agency or the contractor and are predicated on improved safety, more efficient production techniques, ease of maintenance or other valid reasons. Remember though, each component recommended for change is represented by an engineering drawing. As each proposed change is evaluated several key decisions must be made. Is the proposed change "major" or "minor?" Both terms require subjective judgement and vary in definition drastically one time to the next, one department to the next, one company to the next. Inherent in that judgement is whether the component must have a new part number after incorporation of the changes so as to minimize confusion with the originally designed component.

Here's how we as data managers may get into trouble in communicating our requirements on the CDRL. Should the directed change to the engineering drawing be considered as "minor," often times to save pulling the original drawing from the drawing vault only to change a dimension, or a tolerance, or perhaps a specification number on the material or finish of the component, the change notice sheet itself is stapled to the original drawing. The intent is that when the drawing has to be checked out of the vault for a significant revision, the draftsman will go ahead and physically incorporate any of the minor changes that might be stapled onto the drawing. Meanwhile, a copy of the minor revision, identical to that stapled on the original drawing by a vault clerk, is sent to those production departments so that they can pencil the change on the prints that they are working from. Here's the rub. Several (sometimes eight to ten) of these approved changes are stapled to the drawing awaiting the time that a major revision to the drawing is necessary and a draftsman is assigned to physically incorporate all of those change notices into the original drawing. The time for the original drawing to be turned over to the procuring agency comes and no draftsman has been assigned to physically revise the original drawing. Result? The original drawing with any number of change notices stapled to it is sent to your agency as satisfying your CDRL. What are you, the procuring agency, going to do with this situation? Make sure that your CDRL specifies exactly what you want in the way of updated drawings. Legally both described procedures satisfy the words "provide a set of the latest engineering drawings." Should this situation not meet your organization's requirements then you as the Data Manager must spell out on the DD Form 1423 exactly what you do require, i.e., "The final submission of the original engineering drawings (or the 35 mm microfilm negative, if preferred,) will reflect thereon and have incorporated physically therein all the revisions and necessary alterations to depict the latest configuration and status of the hardware it represents." These words are only one example of how you can insure that a draftsman, et al, are assigned to physically update those engineering drawings required on the CDRL.

Now, moving right along in the frenetic activities of an engineering drawing there are several other things you should know about. Should you not want the original drawings but instead require a 35 mm microfilm reproduction of the drawing so that the microfilm can be combined with a computer punch card, containing machine sensible filing and retrieval

information, into what is known as an "aperature card" then read on because several other interesting and very important events happen in the never static life of an engineering drawing. Let's discuss the details of how a six foot (182.88 cm) piece of vellum or mylar drawing paper is reduced to a 5.08 cm by 5.08 cm negative film ready to be mounted on a punch card and be called an aperature card henceforth and forever more.

The drawing must be in sharp contrast to its background color (generally white) and are accomplished using non-smudging pencils. Occassionally a requirement may be imposed on the contractor to furnish ink original drawings but as you can imagine the price estimated for an inked original would be several times that of its predecessor pencil drawing. The need for permanent inked originals should be weighed judiciously because of the extra expense. The drawings, (prepared in pencil or ink) are carefully mounted on large layout grid boards under extremely large and complex photographic equipment capable of maintaining high resolution and clarity of detail while reducing the drawing content to a standard 35 mm negative. Reductions of 24 to 1 and 36 to 1 are common. This process is usually accomplished in strict adherence to MIL-M-9868D, "Microfilming of Engineering Documents, 35MM." It is suggested that serious-minded students desiring to improve their data management skills relating to microfilm study MIL-M-9868D in detail. The film is developed much like other commercial photographic processing except the quality control is much more stringent due to the requirements specified in MIL-M-9868D. Reprocurement data (engineering drawings, drawing lists, and other related data) is generally Type I Silver Halide microfilm, Class 1 Camera microfilm (negative type) clear-line image. This type and class are very expensive options; however, their role in life is critical to an effective supply support in the form of information upon which to base a spare or repair parts procurement. This role in life must be evaluated very seriously and judiciously against such factors as the need for this level of sophisticated and expensive data preparation.

B. PRICE CALCULATIONS

1. This Appendix contains average manhour information for the initial preparation of a (stated standard) size drawing. Appropriate allowances, up and down, must be made for Engineering Change Notices, Engineering Change Proposals (ECP), Tracing, Redraw and Touch-up and other engineering drawing related tasks.

2. As stated on pages 7-3 and 7-4, three major groups of pricing efforts are utilized in determining data price estimates. Insofar as Engineering Drawings are concerned, these group categories are judgement

factors on the part of the contractor as are his assignment of the effort under "simple," "average," and "complex."

3. On many contracts the contractor must prepare drawings for his own design and production use, therefore, this effort is generally chargeable to preliminary design or other engineering task. Contractor compliance with government requirements for drawings, as delineated in MIL-D01000A and MIL-STD-100B is primarily format. Accordingly, contractors generally code the MIL-D-1000A drawings as Group II. The next thirteen (13) pages contain the drafting, controlling, checking, reproduction and supervision. Page 7-34 through 7-46 show the detailed manhour average correlated to drawing sizes "A" through "K."

4. In order for a contractor to establish a credible (acceptable) price estimate for a "drawing package" (excluding revisions) the following steps are usually considered:

a. Estimate the number of drawings (rough sketches and final).

b. Determine an average size drawing for the entire package.

c. Select the appropriate average manhours from Table 7-A, 7-B, or 7-C contingent upon the assigned group and estimated complexity.

d. Ascertain the average hourly "dollar rate" for the total preparation tasks, i.e., design, drafting, controlling, checking, supervision, and reproduction. (NOTE: Hourly rates differ by contractor and from one industry to another, geographical location, area economy, etc. Current rates should be obtained from the contractor through the Procurement Contracting Officer (PCO).)

e. Multiply total manhours by average hourly rate.

f. Manhour information contained in these tables do not include G & A, overhead, material cost and profit. If the hourly rates provided by the contractor included overhead, profit, etc., no further adjustment is required. If hourly rates provided by the contractor are for direct labor only, then Step 5 above must be extended to include G & A, overhead, profit, etc., as applicable to the particular contractor and as directed by your Procurement Contracting Officer (PCO).

ENGINEERING DRAWINGS

TOTAL AVERAGE MANHOURS FOR PREPARATION OF INITIAL DRAWINGS

Drawing Sizes	GROUP I		
	Simple	Average	Complex
FLAT			
"A" - 8 1/2" X 11" (.65 sq ft)	1.2	2.3	4.4
"B" - 11" X 17 (1.30 sq ft)	2.9	4.9	8.8
"C" - 17" X 22" (2.60 sq ft)	6.2	9.9	17.6
"D" - 22" X 34" (5.20 sq ft)	10.7	21.0	35.6
"E" - 34" X 44" (10.40 sq ft)	21.6	41.7	71.2
"F" - 28" X 40" (9.33 sq ft)	19.6	37.3	63.2
ROLL			
"G" - Min - 11" X 42" (3.8 sq ft)	8.1	15.3	25.8
Max - 11" X 144" (13.2 sq ft)	28.1	53.0	89.8
"H" - Min - 28" X 48" (11.2 sq ft)	23.5	44.8	76.2
Max - 28" x 144" (33.6 sq ft)	71.2	135.1	228.5
"J" - Min - 34" X 48" (13.6 sq ft)	28.9	54.7	92.5
Max - 34" X 144" (40.8 sq ft)	86.5	163.9	277.4
"K" - Min - 40" X 48" (16.0 sq ft)	34.0	64.8	108.8
Max - 49" X 144" (48.0 sq ft)	101.7	192.8	326.4

7A34

ENGINEERING DRAWINGS

TOTAL AVERAGE MANHOURS FOR PREPARATION OF INITIAL DRAWINGS

Drawing Sizes	GROUP II		
	Simple	Average	Complex
FLAT			
"A" - 8 1/2" X 11" (.65 sq ft)	.5	1.3	2.2
"B" - 11" X 17" (1.30 sq ft)	1.2	2.6	4.6
"C" - 17" X 22" (2.60 sq ft)	3.1	4.9	8.4
"D" - 22" X 34" (5.20 sq ft)	9.8	12.6	18.1
"E" - 34" X 44" (10.40 sq ft)	12.6	22.2	36.4
"F" 28" X 40" (9.33 sq ft)	11.8	20.3	32.6
ROLL			
"G" - Min - 11" X 42" (3.8 sq ft)	4.8	8.4	13.3
Max - 11" X 144" (13.2 sq ft)	16.7	28.7	46.4
"H" - Min - 38" X 48" (11.2 sq ft)	13.9	24.2	39.3
Max - 28" X 144" (33.6 sq ft)	42.5	73.1	118.0
"J" - Min - 34" X 48" (13.6 sq ft)	17.2	29.6	47.7
Max - 34" X 144" (40.8 sq ft)	51.5	88.7	143.2
"K" - Min - 40" X 48" (16.0 sq ft)	20.3	34.9	56.2
Max - 40" X 144" (48.0 Sq ft)	60.5	104.3	168.4

7A35

ENGINEERING DRAWINGS

TOTAL AVERAGE MANHOURS FOR PREPARATION OF INITIAL DRAWINGS

Drawing Sizes	GROUP III		
	Simple	Average	Complex
FLAT			
"A" - 8 1/2" X 11" (.65 sq ft)	.3	.4	.5
"B" - 11" X 17" (1.30 sq ft)	.6	.7	.9
"C" - 17" X 22" (2.60 sq ft)	1.5	1.6	1.8
"D" - 22" X 34" (5.20 sq ft)	2.5	2.8	3.2
"E" - 34" X 44" (10.40 sq ft)	4.8	5.4	6.2
"F" - 28" X 40" (9.33 sq ft)	4.9	5.4	6.1
ROLL			
"G" - Min - 11" X 42" (3.8 sq ft)	2.2	2.3	2.6
Max - 11" X 144" (13.2 sq ft)	7.0	7.8	8.9
"H" - Min - 28" X 48" (11.2 sq ft)	5.7	6.3	7.3
Max - 28" X 144" (33.6 sq ft)	17.8	19.8	22.9
"J" - Min - 34" X 48" (13.6 sq ft)	7.2	8.0	9.2
Max - 34" x 144" (40.8 sq ft)	21.6	24.0	27.6
"K" - Min - 40" X 48" (16.0 sq ft)	8.5	9.5	10.9
Max - 40" X 144" (48.0 sq ft)	25.3	28.3	32.6

ENGINEERING DRAWINGS

MANHOUR AVERAGES FOR PREPARATION OF SIZE "A" DRAWINGS

8 1/2" x 11" (.65 sq ft) FLAT

GROUPS OF PREPARATION EFFORT	TOTAL MANHOURS	SUPERVISION	DESIGN	CHECKING	DRAFTING	CONTROL	REPRODUCTION
Group I							
Simple	1.2	.01	.12	.14	.59	.07	.31
Average	2.3	.04	.22	.31	1.30	.15	.31
Complex	4.4	.08	.48	.62	2.59	.31	.31
Group II							
Simple	.5	.01	.05	.06	.28	.03	.31
Average	1.3	.01	.10	.15	.62	.07	.31
Complex	2.2	.02	.23	.30	1.2	.15	.31
Group III							
Simple	.3	.01	---	.01	---	.01	.31
Average	.4	.01	---	.04	---	.02	.31
Complex	.5	.02	---	.08	---	.04	.31

7A37

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ENGINEERING DRAWINGS

MANHOUR AVERAGES FOR PREPARATION OF SIZE "B" DRAWINGS

11" x 17" (1.30 sq ft) FLAT

GROUPS OF PREPARATION EFFORT	TOTAL MANHOURS	SUPERVISION	DESIGN	CHECKING	DRAFTING	CONTROL	REPRODUCTION
Group I							
Simple	2.9	.10	.3	.3	1.5	.1	.6
Average	4.9	.10	.5	.6	2.8	.3	.6
Complex	8.8	.20	1.0	1.2	5.2	.6	.6
Group II							
Simple	1.2	.03	.06	.09	.3	.04	.6
Average	2.6	.05	.23	.27	1.3	.14	.6
Complex	4.6	.10	.48	.57	2.5	.29	.6
Group III							
Simple	.6	.01	---	.04	---	.02	.6
Average	.7	.02	---	.08	---	.04	.6
Complex	.9	.04	---	.2	---	.07	.6

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ENGINEERING DRAWINGS

MANHOUR AVERAGES FOR PREPARATION OF SIZE "C" DRAWINGS

17" x 22" (2.60 sq ft) FLAT

GROUPS OF PREPARATION EFFORT	TOTAL MANHOURS	SUPERVISION	DESIGN	CHECKING	DRAFTING	CONTROL	REPRODUCTION
Group I							
Simple	6.2	.9	.5	.6	2.7	.3	1.2
Average	9.9	.2	1.1	1.2	5.5	.7	1.2
Complex	17.6	.4	2.0	2.4	10.4	1.2	1.2
Group II							
Simple	3.1	.1	.2	.3	1.2	.1	1.2
Average	4.9	.1	.4	.5	2.5	.2	1.2
Complex	8.4	.2	.8	1.0	4.7	.5	1.2
Group III							
Simple	1.5	.1	---	.1	---	.1	1.2
Average	1.6	.1	---	.2	---	.2	1.2
Complex	1.8	.1	---	.3	---	.2	1.2

7A39

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ENGINEERING DRAWINGS

MANHOUR AVERAGES FOR PREPARATION OF SIZE "D" DRAWINGS

22" x 34" (5.20 sq ft) FLAT

GROUP OF PREPARATION EFFORT	TOTAL MANHOURS	SUPERVISION	DESIGN	CHECKING	DRAFTING	CONTROL	REPRODUCTION
Group I							
Simple	10.7	.3	1.1	1.4	5.5	.3	2.1
Average	21.0	.6	2.4	2.9	11.8	1.2	2.1
Complex	35.6	1.0	4.2	5.2	21.0	2.1	2.1
Group II							
Simple	9.8	.2	1.0	1.2	4.8	.5	2.1
Average	12.6	.3	1.3	1.6	6.6	.7	2.1
Complex	18.1	.5	2.0	2.5	10.0	1.0	2.1
Group III							
Simple	2.5	.1	---	.2	----	.1	2.1
Average	2.8	.1	---	.4	----	.2	2.1
Complex	3.2	.1	---	.7	----	.3	2.1

7A40

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ENGINEERING DRAWINGS

MANHOUR AVERAGES FOR PREPARATION OF SIZE "E" DRAWINGS

34" x 44" (10.40 sq ft) FLAT

GROUP OF PREPARATION EFFORT	TOTAL MANHOURS	SUPERVISION	DESIGN	CHECKING	DRAFTING	CONTROL	REPRODUCTION
Group I							
Simple	21.6	.5	2.2	2.7	10.9	1.1	4.2
Average	41.7	1.1	4.7	5.8	23.5	2.4	4.2
Complex	71.2	2.0	8.4	10.4	42.0	4.2	4.2
Group II							
Simple	12.6	.3	1.0	1.3	5.3	.5	4.2
Average	22.2	.6	2.2	2.8	11.3	1.1	4.2
Complex	36.4	1.0	4.0	5.0	20.2	2.0	4.2
Group III							
Simple	4.8	.1	---	.4	----	.1	4.2
Average	5.4	.1	---	.8	----	.3	4.2
Complex	6.2	.1	---	1.4	----	.5	4.2

ENGINEERING DRAWINGS

MANHOUR AVERAGES FOR PREPARATION OF SIZE "F" DRAWINGS

28" x 40" (9.33 sq ft) FLAT

GROUP OF PREPARATION EFFORT	TOTAL MANHOURS	SUPERVISION	DESIGN	CHECKING	DRAFTING	CONTROL	REPRODUCTION
Group I							
Simple	19.6	.3	1.8	2.3	9.7	1.1	4.4
Average	37.3	.7	3.9	4.9	20.9	2.5	4.4
Complex	63.2	1.3	7.0	8.8	37.3	4.4	4.4
Group II							
Simple	11.8	.2	.9	1.1	4.7	.5	4.4
Average	20.3	.3	1.9	2.4	10.1	1.2	4.4
Complex	32.6	.6	3.4	4.2	17.9	2.1	4.4
Group III							
Simple	4.9	.1	---	.3	----	.1	4.4
Average	5.4	.1	---	.6	----	.3	4.4
Complex	6.1	.1	---	1.1	----	.5	4.4

7A42

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ENGINEERING DRAWINGS

MANHOUR AVERAGES FOR PREPARATION OF SIZE "K" DRAWINGS

40" x 48" to max of 40" x 144" (16.0 sq ft) ROLL

GROUP OF PREPARATION EFFORT	TOTAL MANHOURS		SUPERVISION		DESIGN		CHECKING		DRAFTING		CONTROL		REPRODUCTION	
	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
Group I														
Simple	34.0	101.7	.6	1.7	3.1	9.3	4.0	11.9	16.7	50.1	2.0	5.9	7.6	22.8
Average	64.3	192.8	1.2	3.6	6.7	20.1	8.5	25.6	36.0	107.9	4.3	12.8	7.6	22.8
Complex	108.8	326.4	2.2	6.5	12.0	35.9	15.2	45.8	64.2	192.6	7.6	22.8	7.6	22.8
Group II														
Simple	20.3	60.6	.3	.8	1.5	4.5	1.9	5.7	8.0	24.0	1.0	2.8	7.6	22.8
Average	34.9	104.3	.6	1.7	3.2	9.6	4.1	12.3	17.3	51.8	2.1	6.1	7.6	22.8
Complex	56.2	168.4	1.1	3.1	5.8	17.2	7.3	22.0	30.8	92.4	3.6	10.9	7.6	22.8
Group III														
Simple	8.5	25.3	.1	.2	---	----	.5	1.5	----	----	.3	.8	7.6	22.8
Average	9.5	28.3	.2	.5	---	----	1.1	3.3	----	----	.6	1.7	7.6	22.8
Complex	10.9	32.6	.3	.8	---	----	2.0	6.0	----	----	1.0	3.0	7.6	22.8

7A43

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ENGINEERING DRAWINGS

MANHOUR AVERAGES FOR PREPARATION OF SIZE "J" DRAWINGS

34" x 48" to max of 34" x 144" (13.6 to 40.8 sq ft) ROLL

GROUP OF PREPARATION EFFORT	TOTAL MANHOURS		SUPERVISION		DESIGN		CECKING		DRAFTING		CONTROL		REPRODUCTION	
	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
Group I														
Simple	28.9	86.5	.5	1.4	2.7	8.0	3.3	10.1	14.2	42.6	1.7	5.0	6.5	19.4
Average	54.7	163.9	1.1	3.1	5.7	17.1	7.2	21.7	30.6	91.7	3.6	10.9	6.5	19.4
Complex	92.5	277.4	1.9	5.5	10.2	30.6	12.8	38.8	54.6	163.7	6.5	19.4	6.5	19.4
Group II														
Simple	17.2	51.5	.2	.7	1.3	3.8	1.6	4.8	6.8	20.4	.8	2.4	6.5	19.4
Average	29.6	88.7	.5	1.5	2.7	8.2	3.5	10.4	14.7	44.0	1.7	5.2	6.5	19.4
Complex	47.7	143.2	.9	2.6	4.9	14.7	6.1	18.6	26.2	78.6	3.1	9.3	6.5	19.4
Group III														
Simple	7.2	21.6	.1	.2	---	----	.4	1.3	----	----	.2	.7	6.5	19.4
Average	8.0	24.0	.1	.4	---	----	.9	2.8	----	----	.5	1.4	6.5	19.4
Complex	9.2	27.6	.2	.7	---	----	1.7	5.0	----	----	.8	2.5	6.5	19.4

ENGINEERING DRAWINGS

MANHOUR AVERAGES FOR PREPARATION OF SIZE "G" DRAWINGS

11" x 42" to max of 11" x 144" (3.8 to 13.2 sq ft) ROLL

GROUP OF PREPARATION EFFORT	TOTAL MANHOURS		SUPERVISION		DESIGN		CHECKING		DRAFTING		CONTROL		REPRODUCTION	
	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
Group I														
Simple	8.1	28.1	.2	.5	.7	2.6	1.0	3.3	3.9	13.8	.5	1.6	1.8	6.3
Average	15.3	53.0	.4	1.0	1.6	5.5	2.0	7.1	8.5	29.6	1.0	3.5	1.8	6.3
Complex	25.8	89.8	.6	1.8	2.8	9.9	3.6	12.6	15.2	52.9	1.8	6.3	1.8	6.3
Group II														
Simple	4.8	16.7	.1	.2	.5	1.2	.5	1.6	1.9	6.6	.2	.8	1.8	6.3
Average	8.4	28.7	.2	.5	.8	2.6	1.0	3.4	4.1	14.2	.5	1.7	1.8	6.3
Complex	13.3	46.4	.3	.9	1.3	4.8	1.7	6.0	7.3	25.4	.9	3.0	1.8	6.3
Group III														
Simple	2.2	7.0	.1	.1	---	---	.2	.4	---	----	.1	.2	1.8	6.3
Average	2.3	7.8	.1	.1	---	---	.3	.9	---	----	.1	.5	1.8	6.3
Complex	2.6	8.9	.1	.2	---	---	.5	1.6	---	----	.2	.8	1.8	6.3

7A45

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ENGINEERING DRAWINGS

MANHOUR AVERAGES FOR PREPARATION OF SIZE "H" DRAWINGS

28" x 48" to max of 28" x 144" (11.2 to 33.6) ROLL

GROUP OF PREPARATION EFFORT	TOTAL MANHOURS		SUPERVISION		DESIGN		CHECKING		DRAFTING		CONTROL		REPRODUCTION	
	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
Group I														
Simple	23.5	71.2	.4	1.2	1.9	6.5	2.5	8.3	12.3	35.0	1.3	4.2	5.1	16.0
Average	44.8	135.1	.8	2.6	4.1	14.1	5.4	17.9	26.5	75.5	2.9	9.0	5.1	16.0
Complex	76.2	228.5	1.5	4.6	7.4	25.1	9.7	32.0	47.4	134.8	5.1	16.0	5.1	16.0
Group II														
Simple	13.9	42.5	.2	.6	.9	3.1	1.2	4.0	5.9	16.8	.6	2.0	5.1	16.0
Average	24.2	73.1	.4	1.2	2.0	6.8	2.6	8.6	12.7	36.2	1.4	4.3	5.1	16.0
Complex	39.3	118.0	.7	2.2	3.6	12.0	4.7	15.4	22.8	64.7	2.4	7.7	5.1	16.0
Group III														
Simple	5.7	17.8	.1	.2	---	---	.3	1.1	----	----	.2	.5	5.1	16.0
Average	6.3	19.8	.1	.3	----	---	.7	2.3	----	----	.4	1.2	5.1	16.0
Complex	7.3	22.9	.2	.6	---	---	1.3	4.2	----	----	.7	2.1	5.1	16.0

7446

ENGINEERING DRAWINGS

TOTAL AVERAGE MANHOURS TO PERFORM DRAWING FUNCTIONS

	Drawing Size	To Trace	To Redraw	To Touch-up
	A	1.5	1.5	.20
	B	1.5	1.5	.25
See Note 1	C	2.0	2.0	.50
	D	5.0	10.0	.75
	E	10.0	12.0	1.25
	F	16.0	24.0	2.0
	G	20.0	26.0	2.20
	H	48.0	60.0	2.5
See Note 2	I	48.0	60.0	2.5
	J	48.0	60.0	2.5

7A47

NOTES: Average Cost to Microfilm *

1. Drawing sizes "A" through "E" is $2.57 each frame
2. Drawing sizes "F" through "K" is $3.61 each frame**

* This includes camera and drawing set-up, exposing/developing/ inspecting/ packaging/delivering the negative to the procuring agency.

** Larger drawings require two or three frames to capture total drawing. This factor is contingent upon the capabilities of the camera and layout area.

APPENDIX C

TECHNICAL MANUALS

A. This appendix contains average manhour information for the initial preparation of technical manuals (in the Air Force these manuals are referred to as Technical Orders or just T.O.s). Similar to most contractor prepared data, the preparation tasks must be judged as simple, average, and complex. Chapter 5D provided many details to you relative to the general requirements for technical manuals, the rationale behind verification and validation, the approximate cost ratio to the total system costs and other factors. What you should learn from this appendix is the average manhours expended by the various technical specialists involved in researching and producing a technical manual.

B. When a contractor sets about to price a technical manual (and thus when you set about to analyze those costs) he generally employs the following logic which also happens to be some of the same steps in logic reflected on data pricing forms DD Form 633-2 and the proposed pricing form PPM 370 shown on Page 7-

1. Estimate the number of new pages of text.

2. Estimate the number of revised pages of text.

3. Estimate the number of new pages of illustration.

4. Estimate the number of revised pages of illustration.

5. Judge and assign category of difficulty (simple, average, or complex) to each set of totals under 1, 2, 3 and 4 above.

6. Calculate the number of manhours by professional category required to provide the total number of pages estimated under 1, 2, 3 and 4 above.

7. Apply the hourly rates against the total number of manhours by professional category calculated under 6 above.

8. Using the total dollars aggregated in typical accounting cost pools such as Direct Labor, Direct Material, etc., all general administrative and overhead rates must be calculated.

9. The final total after all costs are considered becomes the price of the subject technical manual.

C. Two principal cost drivers are responsible for the high prices paid by DOD for technical manuals. One is sheer volume. It is estimated that over two billion (2,000,000,000) technical manual pages are prepared and printed annually. This equates to almost 5 1/2 million pages a day. The other cost drivers are not so dramatic but nevertheless are just as important in sustaining the high prices paid for technical manuals. As previously stated in Chapter 5D, the contractors do not use a one-to-one ratio in pricing out pages in a technical manual. You will remember their pricing formula goes something like all costs involved in the preparation and printing of a photolithographic master ready for government printing plus all costs associated with two changes to that page the first year, one change the next year, and one-half a change per page for each of the elapsed years until the operational, test, and evaluation phase is complete on all major subsystems. All of this equates out to a legal maneuver to double the price quoted on every technical manual page. Two other cost drivers relate to the complexity of the illustrations and the high quality of photolithographic master that is required for the massive printing quantities involved. The complexity necessitates an enlargement of the displayed assembly, sub-assembly, or component to a minimum of 30 X 40 inches with all line artwork to be of a very heavy inked line, and all lettering to be mechanically applied (as opposed to free hand). This enlargement permits ease of reading clarity when the 30 X 40 is reduced photographically to either an 8" X 10 1/2" or 8 1/2" X 11" page of a technical manual. Remember, the reduced photolithographic negative is what is received by the Government Printing Office (G.P.O.) but now you know that a lot of things have to happen before a technical manual is ready to use. Also remember there are thousancds of end items on a major weapon system and that each may require up to a dozen separate and distinct manuals. For example there are manuals to describe each step in the operation of the end item; i.e., what it is, its function, a step-by-step procedure of how and why it works like it was designed. Now come the how-to-fix it manuals, many times requiring several for each of the normal three levels of maintenance (organization, intermediate and depot). Among the how-to-fix books might be one on cleaning the item, one on calibrating the item, one on how to pack the item for shipment or transient to and from its place of repair, and other important functions. Refer to Page 7A50 for typically applied data item descriptions for technical manuals. Technical manuals are indeed a large and critically important task, and as you now know an awfully expensive propostion.

D. One final word on attempting to rationally identify and evaluate the price that a contractor submits on a technical manual. Do the absolute best job you can do and firmly realize it is far far superior to the job that is being done today.

TYPICAL DATA ITEM DESCRIPTIONS

TECHNICAL MANUALS

	ARMY	NAVY	USAF	DSA USMC	NSA	DOD
PLAN		M-2040	M-3401		M-5084	M-6154
STATUS & SCHEDULING	M-1506	M-2052	M-3402			M-6155
EXPLOSIVE ORDNANCE DISPOSAL (EOD)			M-3403			
CONTRACTOR FURNISHED AERONAUTICAL EQUIPMENT/CONTRACTOR FURNISHED EQUIPMENT (CFAE/CFE)			M-3405A			M-6156
REAL PROPERTY INSTALLED EQUIPMENT (RPIE)			M-3406			
TECHNICAL ORDERS (TOs)	M-1503	M-2044	M-3407	M-4021 M-4701	M-5200 M-5102	
VALIDATION			M-3408		M-5087	M-6159
DEVELOPMENT MANUALS			M-3413	M-4716		M-6157
RESEARCH & DEVELOPMENT SOURCE			M-3414			M-6158
GROUND COMMUNICATIONS-ELECTRONICS-METEOROLOGICAL SITES AND SERVICES			M-3416			
CHANGES	M-1513	M-2046				
REVISIONS		M-2047 M-2048			M-5100 M-5111	M-5112A
MANUAL SUPPLEMENT		M-2049				
MANUSCRIPT		M-2042				
COMMERCIAL		M-2071 M-2050		M-4022DSA M-4707BMC	M-5104B M-5107	M-6153
PRELIMINARY		M-2043			M-5088	

TECHNICAL MANUALS

AVERAGE MANHOURS PER NEW AND REVISED PAGES OF MANUSCRIPT*

(BY PROFESSIONAL CATEGORY)

TYPE OF EFFORT	GROUP I						GROUP II						GROUP III					
	Simple		Average		Complex		Simple		Average		Complex		Simple		Average		Complex	
	New	Rev	New	Rev	New	Rev	New	Rev	New	Rev	New	Rev	New	Rev	New	Rev	New	Rev
ENGINEER	.3	.2	.7	.4	1.0	.5	.1	.1	.3	.2	.5	.3	.1	.1	.1	.1	.1	.1
WRITER	1.0	.5	2.1	1.1	4.0	2.0	.5	.3	1.1	.6	1.9	1.0	.1	.1	.3	.2	.5	.3
EDIT	.4	.2	.6	.3	.8	.4	.3	.2	.4	.3	.5	.3	.2	.1	.2	.1	.3	.2
CLERICAL	1.0	1.0	1.0	1.0	1.0	1.0	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5
PRODUCTION	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
TOTAL	4.2	3.4	5.9	5.4	8.3	5.4	2.9	2.6	3.8	3.1	4.9	3.6	2.4	2.3	2.6	2.4	2.9	2.6

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TECHNICAL MANUALS

TOTAL AVERAGE MANHOURS

NEW PAGES*

NUMBER OF MANUSCRIPT PAGES

		1	5	10	15	20	25	30	35	40	45	50	60	70	80	90	100	200	300
GROUP I	Simple	4.2	21.0	42.0	63.0	84.0	105.0	126.0	147.0	168.0	189.0	210.0	252.0	294.0	336.0	378.0	420.0	840.0	1260.0
	Average	5.9	29.5	59.0	88.5	118.0	147.5	177.0	206.5	236.0	265.5	295.0	354.0	413.0	531.0	531.0	590.0	1180.0	1770.0
	Complex	8.3	41.5	83.0	124.5	166.0	207.5	249.0	290.5	332.0	373.5	415.0	498.0	581.0	664.0	747.0	830.0	1660.0	2490.0
GROUP II	Simple	2.9	14.5	29.0	43.5	58.0	72.5	87.0	101.5	116.0	130.5	145.0	174.0	203.0	232.0	261.0	290.0	580.0	870.0
	Average	3.8	19.0	38.0	57.0	76.0	95.0	114.0	133.0	152.0	171.0	190.0	228.0	266.0	304.0	342.0	380.0	760.0	1140.0
	Complex	4.9	24.5	49.0	73.5	98.0	122.5	147.0	171.5	196.0	220.5	245.0	294.0	343.0	392.0	441.0	490.0	980.0	1470.0
GROUP III	Simple	2.4	12.0	24.0	36.0	48.0	60.0	72.0	84.0	96.0	108.0	120.0	144.0	168.0	192.0	216.0	240.0	480.0	720.0
	Average	2.6	13.0	26.0	39.0	52.0	65.0	78.0	91.0	104.0	117.0	130.0	156.0	182.0	208.0	234.0	260.0	520.0	780.0
	Complex	2.9	14.5	29.0	43.5	58.0	72.5	87.0	101.5	116.0	130.5	145.0	174.0	203.0	232.0	261.0	290.0	580.0	870.0

*9" x 10 1/2" or 8 1/2" x 11"

7A52

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TECHNICAL MANUALS

TOTAL AVERAGE MANHOURS

REVISED PAGES*
NUMBER OF MANUSCRIPT PAGES

		1	5	10	15	20	25	30	35	40	45	50	60	70	80	90	100	200	300
GROUP I	Simple	3.4	17.0	34.0	51.0	68.0	85.0	102.0	119.0	136.0	153.0	170.0	204.0	238.0	272.0	306.0	340.0	680.0	1020.0
	Average	4.3	21.5	43.0	64.5	86.0	107.5	129.0	150.5	172.0	193.5	215.0	258.0	301.0	344.0	387.0	430.0	860.0	1290.0
	Complex	5.4	27.0	54.0	81.0	108.0	135.0	162.0	189.0	216.0	243.0	270.0	324.0	378.0	432.0	486.0	540.0	1080.0	1620.0
GROUP II	Simple	2.6	13.0	26.0	39.0	52.0	65.0	78.0	91.0	104.0	117.0	130.0	156.0	182.0	208.0	234.0	260.0	520.0	780.0
	Average	3.1	15.5	31.0	45.6	62.0	77.5	93.0	108.5	124.0	139.5	155.0	186.0	217.0	248.0	279.0	310.0	620.0	930.0
	Complex	3.6	18.0	36.0	54.0	72.0	90.0	108.0	126.0	144.0	162.0	180.0	216.0	252.0	288.0	324.0	360.0	720.0	1080.0
GROUP III	Simple	2.3	11.5	23.0	34.5	46 0	57.5	69.0	80.5	92.0	103.5	115.0	138.0	161.0	184.0	207.0	230.0	460.0	690.0
	Average	2.4	12.0	24.0	36.0	48.0	60.0	72.0	84.0	96.0	108.0	120.0	144.0	168.0	192.0	216.0	240.0	480.0	720.0
	Complex	2.6	13.0	26.0	39.0	52.0	65.0	78.0	91.0	104.0	117.0	130.0	156.0	182.0	208.0	234.0	260.0	520.0	780.0

*8" x 10 1/2 or 9 1/a x 11"

TECHNICAL MANUALS

TOTAL AVERAGE MANHOURS

NEW-HALFTONE AND LINE ART*

NUMBER OF ILLUSTRATIONS		1	5	10	15	20	25	30	35	40	45	50
GROUP I	Simple	3.0	15.0	30.0	45.0	60.0	75.0	90.0	105.0	120.0	135.0	150.0
	Average	6.4	32.0	64.0	96.0	128.0	160.0	192.0	224.0	256.0	288.0	320.0
	Complex	11.5	57.5	115.0	172.5	230.0	287.5	345.0	402.5	460.0	517.5	575.0
GROUP II	Simple	1.4	7.0	14.0	21.0	28.0	35.0	42.0	49.0	56.0	63.0	70.0
	Average	3.1	15.5	31.0	46.5	62.0	77.5	93.0	108.5	124.0	139.5	155.0
	Complex	5.5	27.5	55.0	82.5	110.0	137.5	165.0	192.5	220.0	247.5	275.0
GROUP III	Simple	.4	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0
	Average	.8	4.0	8.0	12.0	16.0	20.0	24.0	28.0	32.0	36.0	40.0
	Complex	1.5	7.5	15.0	22.5	30.0	37.5	45.0	52.5	60.0	67.5	75.0

*8" x 10 1/2" or 8 1/2" x 11"

NOTE: THESE HOURS MUST BE COMBINED AS APPROPRIATE WITH HOURS TO PREPARE NEW PAGES

EXAMPLE: MANHOURS TO PREPARE 30 NEW PAGES WITH 10 ILLUSTRATIONS WOULD BE 156 FOR A SIMPLE GROUP I DOCUMENT

7A54

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TECHNICAL MANUALS

TOTAL AVERAGE MANHOURS

REVISED-HALFTONE AND LINE ART*

NUMBER OF ILLUSTRATIONS		1	5	10	15	20	25	30	35	40	45	50
GROUP I	Simple	1.5	7.5	15.0	22.5	30.0	37.5	45.0	52.5	60.0	67.5	75.0
	Average	3.2	16.0	32.0	48.0	64.0	80.0	96.0	112.0	128.0	144.0	160.0
	Complex	5.6	28.0	56.0	84.0	112.0	140.0	168.0	196.0	224.0	252.0	280.0
GROUP II	Simple	.7	3.5	7.0	10.5	14.0	17.5	21.0	24.5	28.0	31.5	35.0
	Average	1.6	8.0	16.0	24.0	32.0	40.0	48.0	56.0	64.0	72.0	80.0
	Complex	2.8	14.0	28.0	42.0	56.0	70.0	84.0	98.0	112.0	126.0	140.0
GROUP III	Simple	.2	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
	Average	.4	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0
	Complex	.8	4.0	8.0	12.0	16.0	20.0	24.0	28.0	32.0	36.0	40.0

* 8" x 10 1/2" or 8 1/2" x 11"

NOTE: THESE HOURS MUST BE COMBINED AS APPROPRIATE WITH HOURS TO REVISE MANUAL PAGES.

EXAMPLE: MANHOURS TO REVISE 50 PAGES OF A SIMPLE GROUP I DOCUMENT WITH 10 ILLUSTRATIONS WOULD BE 170+15 = 185

7A55

AVERAGE PREPARATION MANHOURS

By Type of Illustration

Type	Manhour Range*
Halftones **	5-9
Schematics (Foldouts 1 1/2 to 2 hrs additional)	
Simplified or Partial	4-7
Detailed	5-20
Wiring Diagrams	1-4
Block Diagrams	4-8
Wave Form Diagrams	
Line Drawings	2-4
Halftone Shots	2-3
Parts Location (3 Dimensional Drawings)	
Terminal Board w/30 Parts	12-15
Exploded Views (Detailed)	40-50
Voltage Resistance Diagrams	8-15
Distribution Diagrams	30-60
Layout Diagrams	
Electronic	10-15
Mechanical	35-50
Logic Diagrams	16-80
Simplified Test Fixtures	
With Photographic Aids	2-5
Without Photographic Aids	4-10

* DEPENDING ON COMPLEXITY AND SIZE

** HALFTONE: Picture in which the graduation of tone is reproduced by a gradation of dots, produced by the interposition of a screen during exposure. The varying density of the dots and the resultant white space gives an illusion of continuous tone when printed.

PREPARATION OF ART WORK FOR CAMERA READY NEGATIVES FOR TRANSPARENCIES

1 to 10 pieces..... 8 to 24 hours (3 days)

11 to 25 pieces.....25 to 40 hours (5 days)

26 to 50 pieces.....40 to 80 hours (10 days)

51 to 100 pieces.....80 to 160 hours (20 days)

PREPARATION OF WORKING FILM POSITIVES

1 to 100 pieces..... 1 to 16 hours

NOTE: These are mostly Block Diagram types.

PHOTOGRAPH PRICES *

Size	Litho Line Negatives		Halftone Negatives	White Prints (Contract)	Photo-linen (Contract)	Screened Prints from Halftone Negatives
	Negatives	Positives				
5 X 8			10.80			3.35
8 1/2 X 11	3.35	5.00	13.30	2.50	6.60	4.15
10 X 12	7.15	6.60	16.65			
11 X 14	8.30	7.65	19.15	3.35		5.00
11 X 17	10.00	10.00		5.00	13.30	
11 X 24	14.15	13.30				
16 X 20	17.50	16.65		9.15	24.15	
18 X 23	21.64	20.80		11.65	26.65	
20 X 24	24.98	24.15				

Continuous Tone Photograph on 4 X 5 negative (includes 8 X 10 Print)
First Sheet..... 40.00
Additional Sheets..... 25.00

Glass Latern Slides
3 1/4 X 4" black and white..... 13.30
Maximum 1'6" original image width--Maximum 9" original image height
For larger original image, add 90%

NOTE: Prices are for quantities of six and over. For less add 20%

* For estimating purposes only. Will vary by geographical area. Obtain comparison price ranges from Procurement Contracting Officer (PCO).

PHOTOGRAPHY COSTS

Type	Costs *
BLACK & WHITE STILLS	
Cost of taking original (includes cost of film, labor, developing)	
35mm film	$ 1.00 ea
Prints of above (5 X 7)	0.43 ea
COLOR PHOTOGRAPHS	
Same cost increments as above	
35mm film	1.50 ea
Prints of above (3 X 5)	0.65 ea
COLOR TRANSPARENCIES (2 X 2)	
Same cost increments as above	
35mm film	1.50 ea
Cutting, copying, mounting duplicates	0.83 ea
COLOR MOTION PICTURES	
Cost of finished product, taken by professional photographer on high-quality film, developed, printed, edited	
Per running minute	$1650.00
LARGER BLACK AND WHITE PHOTOGRAPHS	
8 X 10 original	35.00[1]

[1] If taken in small quantities; if considerable number shot at same time, same approximate location, cost should drop to approximately $20.00 each

Prints of above: 1st @ 3.35; subsequent copies of same @ .35 each

* Costs will vary by geographical area

REPRO TYPING & PROOFING RATES *

IBM Executive Type, 12 pt. Boldface #1 or 10 pt. Boldface #2, on repro paper

PROSE TEXT ONLY - MINIMUM 20 PAGES

	8 1/2 X 11 Page Size			11 X 17 Page Size		
	Single Spaced	1-1/2 Spaced	Double Spaced	Single Spaced	1-1/2 Spaced	Double Spaced
One Column Unjustified	$ 4.30	$ 4.00	$ 3.50	$ 6.50	$ 5.75	$ 4.75
One Column Justified	8.00	7.00	6.60	11.00	10.00	9.25
Two Column Justified	12.00	10.50	10.00	14.50	13.00	11.75
Tabular	7.50	7.00	6.50	10.00	9.00	8.00

VARITYPER RATE

	8 1/2 X 11 Page Size
One Column Justified	$9.00
One Column Unjustified	6.00

* For Estimating Purposes Only. Will vary by geographical area.

PRINTING AND COLLATING

MANHOURS

Using single plates (both sides - 2 operations)

Printing..... 20 to 40 hours

5000 pages
average time required..... 1000 to 1500 per hour

Collating average of 50 copies at approximately 450 sheets each - printed on both sides

Machine Time..... 5 to 15 hours

Per hand collating, same effort, time will run from 40 minutes to 1 1/2 hours maximum, or 1000 to 3000 sheets for hand collating per hour.

(NOTE: Binding included in the above hours.)

APPENDIX D

PROVISIONING DOCUMENTATION

This Appendix contains average manhour information for the preparation of five commonly imposed data requirements in a double matrix of job speciality versus the three major groups of pricing efforts used in determining the price contractors assign to provisioning related data item sequences. For these common documents, the manhours shown include identification, determination of initial requirements, cataloging actions and other technical aspects of provisioning.

Most major aerospace contractors, as well as many vendors have automated their provisioning data and simply reformat these elements mechanically to produce the five basic documents calculated on the next chart in only a fraction of the manhours shown. Automated provisioning techniques should be evaluated as a part of the data base management system submitted and not in accordance with the next chart.

		GROUP I			GROUP II			GROUP III		
		SIMPLE	AVERAGE	COMPLEX	SIMPLE	AVERAGE	COMPLEX	SIMPLE	AVERAGE	COMPLEX
PRELIMINARY PARTS LISTS	INVENTORY SPECIALIST	20.0	25.0	30.0	4.0	8.0	14.0	1.0	2.0	4.0
	CLERICAL	6.0	8.0	9.0	1.0	2.0	4.0	1.0	1.0	1.0
	PRODUCTION	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
1000 ITEMS	TOTAL	28.0	35.0	41.0	7.0	12.0	20.0	4.0	5.0	7.0
PRODUCTION LIST	INVENTORY SPECIALIST	55.0	69.0	83.0	30.0	22.0	40.0	3.0	6.0	11.0
	CLERICAL	17.0	21.0	25.0	3.0	7.0	12.0	1.0	2.0	3.0
	PRODUCTION	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
500 ITEMS	TOTAL	78.0	96.0	114.0	19.0	35.0	58.0	10.0	14.0	20.0
GROUP ASSEMBLY PARTS LIST	INVENTORY SPECIALIST	100.0	182.0	250.0	31.0	67.0	120.0	9.0	18.0	33.0
	PROOFING	16.0	29.0	40.0	5.0	11.0	19.0	1.0	1.0	5.0
	CLERICAL	20.0	36.0	50.0	6.0	13.0	24.0	2.0	2.0	7.0
	PRODUCTION	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
2000 ITEMS	TOTAL	156.0	267.0	360.0	62.0	111.0	183.0	32.0	45.0	65.0
BULK ITEM LIST	INVENTORY SPECIALIST	7.0	8.0	10.0	1.0	3.0	5.0	1.0	1.0	1.0
	PROOFING	3.0	4.0	5.0	1.0	1.0	2.0	1.0	1.0	1.0
	CLERICAL	10.0	12.0	15.0	2.0	4.0	7.0	1.0	1.0	1.0
	PRODUCTION	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
500 ITEMS	TOTAL	22.0	26.0	32.0	6.0	10.0	16.0	5.0	5.0	5.0
ITEM DESCRIPTIONS FIIG 5s	INVENTORY SPECIALIST	374.0	1400.0	3000.0	200.0	806.0	1440.0	101.0	218.0	390.0
	PROOFING	60.0	224.0	480.0	32.0	129.0	230.0	16.0	35.0	62.0
	CLERICAL	74.0	280.0	600.0	40.0	161.0	288.0	20.0	44.0	78.0
	PRODUCTION	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0
2000 ITEMS	TOTAL	583.0	1979.0	4155.0	347.0	1171.0	2033.0	212.0	372.0	605.0

7A63

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APPENDIX E

SPECIFICATIONS

This Appendix contains average manhour information for the preparation of specifications. Like other types of data, the three major groups of simple, average, and complex, are utilized in determining data price estimates for specifications.

Specifications are expensive data items due to their built-in "Christmas tree" effect, and are considered basic source documentation.

Specifications are generally prepared in compliance with a Government statement of requirements and would be coded Price Group I. Specifications prepared by the contractor as basic source documentation for his own use in manufacturing hardware are amended to satisfy the content and format requirements stated in the contract and are coded Price Group II by the contractor. "As is," existing contractor-prepared specification, involve only reproduction and delivery charges and the contractor will code this type data as Price Group III.

Many specifications furnished the Government to satisfy "configuration management" data requirements are those which the contractor had to prepare for his own in-house use. The bulk of this preparation effort should be chargeable to engineering or design time and not to documentation. Accordingly, Price Groups II and III are used. In some instances, contractors use "industry standard" specifications applicable to many contractual efforts. Delivery of such specifications to the Government are generally coded Price Group III.

SPECIFICATIONS

ALL LEVELS OF INDENTURE

AVERAGE MANHOURS PER PAGE BY TASK ELEMENTS

Type of Effort	GROUP #1			GROUP #2			GROUP #3		
	Simple	Average	Complex	Simple	Average	Complex	Simple	Average	Complex
Engineer	2.9	6.3	11.2	1.4	3.0	5.4	.2	.8	1.5
Engr Asst	.6	1.3	2.3	.3	.6	1.1	.1	.2	.3
Clerical	.2	.4	.8	.1	.2	.4	.1	.1	.1
Art/Drafting	.2	.5	.9	.1	.2	.4	.1	.1	.1
Production	.8	.8	.8	.8	.8	.8	.8	.8	.8
Total	4.7	9.3	16.0	2.7	4.8	8.1	1.3	2.0	2.8

NOTES:

a. Page Size: 8" x 10 1/2" or 8 1/2" x 11"

b. Revision of Specifications amount up to 45% of above Manhours

7A65

SPECIFICATIONS

ALL LEVELS OF INDENTURE

TOTAL AVERAGE MANHOURS

NUMBER OF PAGES		1	5	10	15	20	25	30	35	40	45	50
GROUP I	Simple	4.7	23.5	47.0	70.5	94.0	117.5	141.0	164.5	188.0	211.5	235.0
	Average	9.3	46.5	93.0	139.5	186.0	232.5	279.0	279.0	372.0	418.5	465.0
	Complex	16.0	80.0	160.0	240.0	320.0	400.0	480.0	560.0	640.0	720.0	800.0
GROUP II	Simple	2.7	13.5	27.0	40.5	54.0	67.5	81.0	94.5	108.0	121.5	135.0
	Average	4.8	24.0	48.0	72.0	96.0	120.0	144.0	168.0	192.0	216.0	240.0
	Complex	8.1	40.5	81.0	121.5	162.0	202.5	243.0	283.5	324.0	364.5	405.0
GROUP III	Simple	1.3	6.5	13.0	19.5	26.0	32.5	39.0	45.5	52.0	58.5	65.0
	Average	2.0	10.0	20.0	30.0	40.0	50.0	60.0	70.0	80.0	90.0	100.0
	Complex	2.8	14.0	28.0	42.0	56.0	70.0	84.0	98.0	112.0	126.0	140.0

NOTES: A. PAGE SIZE: 8' x 10 1/2" or 8 1/2"x 11"

B. REVISION OF SPECIFICATIONS AMOUNT UP TO 45% OF ABOVE MANHOURS

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APPENDIX F

PLANS

This Appendix contains average manhour information for the preparation of plans.

Manhour information for "plans" are less specific than for engineering drawings, for instance. This category is more generalized and can be used for the evaluation of such things as configuration management or control plans, reliability demonstration plans, test plans, subsystem plans, safety engineering plans, production support plans, quality assurance program plans, manufacturing plans, other types of plans as well as various types of studies. Like other types of data, the three major groups of pricing effort are utilized in determining price estimates for plans.

The Price Group effort code applied by a contractor to a specific plan or study may be either Code I, II or III depending on whether or not he had to prepare the document for his own use. Relatively few plans are coded Group I. The majority of plans are coded either Group II or III. Studies generally follow the same pattern. A definition or feasibility study, for instance, may be the end product of a Research and Development contract and in these cases would be coded Group III with only reproduction and delivery charges being identified as data costs. The Price Group coding of plans and studies may be different for similar type data on the same contract.

PLANS

(Configuration Plans, Studies etc)

AVERAGE MANHOURS PER PAGE

By Task Element

TYPE OF EFFORT	GROUP I			GROUP II			GROUP III		
	SIMPLE	AVERAGE	COMPLEX	SIMPLE	AVERAGE	COMPLEX	SIMPLE	AVERAGE	COMPLEX
ENGINEER	2.1	4.5	8.0	1.0	2.1	3.8	.3	.6	1.0
ENGR ASST	1.7	3.4	6.0	.8	1.6	2.9	.2	.4	.8
CLERICAL	.3	.6	1.0	.1	.3	.5	.1	.1	.1
ART/DRAFTING	.8	1.7	3.0	.2	.8	1.4	.1	.2	.4
PRODUCTION	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
TOTAL	6.2	11.5	19.3	3.4	6.1	9.9	2.0	2.6	3.6

Page Size: 8" x 10 1/2" or 8 1/2" x 11"

7A68

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PLANS

(Configuration Plans, Studies etc.)

TOTAL AVERAGE MANHOURS

NO OF PAGES		1	5	10	15	20	25	30	35	40	45	50
GROUP I	Simple	6.2	31.0	62.0	93.0	124.0	155.0	186.0	217.0	248.0	279.0	310.0
	Average	11.5	57.5	115.0	172.5	230.0	287.5	345.0	402.5	460.0	517.5	575.0
	Complex	19.3	96.5	193.0	289.5	386.0	482.5	579.0	675.5	772.0	868.5	965.0
GROUP II	Simple	3.4	17.0	34.0	51.0	68.0	85.0	102.0	119.0	136.0	153.0	170.0
	Average	6.1	30.5	61.0	91.5	122.0	152.5	183.0	213.5	244.0	274.5	305.0
	Complex	9.9	49.5	99.0	148.5	198.0	247.5	297.0	346.5	396.0	445.5	495.0
GROUP III	Simple	2.0	10.0	20.0	30.0	40.0	50.0	60.0	70.0	80.0	90.0	100.0
	Average	2.6	13.0	26.0	39.0	52.0	65.0	78.0	91.0	104.0	117.0	130.0
	Complex	3.6	18.0	36.0	54.0	72.0	90.0	108.0	126.0	144.0	162.0	180.0

7A69

Page Size: 8" x 10-1/2" or 8-1/2" x 11"

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APPENDIX G

REPORTS

This Appendix contains average manhour information for the preparation of Reports.

Manhours concerning Reports preparation are generalized. Reports can be a very expensive data, since this category covers the widest range of documentation acquired from the contractors. Examples of the various type Reports are: Configuration Status Accounting Reports, Flight Test Reports, Engineering Data Analysis Reports, Production Analysis Reports, Safety Analysis Reports, Facility Design Criteria Reports, Evaluation Test Data Reports, Experimental Test Reports, Human Engineering Reports, Qualitative and Quantitative Personnel Requirements Reports, Electronic Interference Test Reports, Reliability and Maintainability Failure Reports, Daily, Weekly, Monthly, and Quarterly Progress Reports, Performance Characteristic Analysis Reports and various other technical and non-technical type Reports. Like other types of data, the three major groups of pricing effort are utilized in determining price estimates for Reports.

Many reports are prepared solely for government use and are coded Group I. Others are prepared for the contractor's and government's use, and are for the most part coded Group II. A small portion of Reports are coded Group III. Certain types of test Reports are very expensive because their preparation entails the use of special equipment to record test data and may also involve travel and per diem expenses to test sites, etc., all costs of which are chargeable to the Report.

Manhour information for Reports shown on Pages 7A71 and 7A72 to evaluate data prices for such things as Test Procedures, and various types of Schedules and Special Instructions.

REPORT

(Status, Test Reports etc)

AVERAGE MANHOURS PER PAGE BY TASK ELEMENTS

TYPE OF EFFORT	Simple	Average	Complex	Simple	Average	Complex	Simple	Average	Complex
ENGINEER	2.1	4.5	8.0	1.0	2.1	3.8	.3	.6	1.0
ENGR ASST	.8	1.7	3.1	.4	.8	1.5	.1	.2	.4
CLERICAL	.3	.6	1.0	.1	.3	.5	.1	.1	.1
ART/DRAFTING	1.0	2.2	3.9	.5	1.1	1.9	.1	.3	.5
PRODUCTION	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
TOTAL	5.5	10.3	17.3	3.3	5.6	9.0	1.9	2.5	3.3

Page Size: 8" x 10 1/2" or 8 1/2" x 11"

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7A71

REPORTS

STATUS, TEST REPORTS ETC.

TOTAL AVERAGE MANHOURS

NUMBER OF PAGES		1	5	10	15	20	25	30	35	40	45	50
GROUP I	Simple	5.5	27.5	55.0	82.5	110.0	137.9	165.0	192.5	220.0	247.5	275.0
	Average	10.3	51.5	103.0	154.5	206.0	257.5	309.0	360.0	412.0	463.5	515.0
	Complex	17.3	86.5	173.0	259.5	346.0	432.5	519.0	605.5	692.0	778.5	865.0
GROUP II	Simple	3.3	16.5	33.0	49.5	66.0	82.5	99.0	115.5	132.0	148.5	165.0
	Average	5.6	28.0	56.0	84.0	112.0	140.0	168.0	196.0	224.0	252.0	280.0
	Complex	9.0	45.0	90.0	135.0	180.0	225.0	270.0	315.0	360.0	405.0	450.0
GROUP III	Simple	1.9	9.5	19.0	28.5	38.0	47.5	57.0	66.5	76.0	85.5	95.0
	Average	2.5	12.5	25.0	37.5	50.0	62.5	75.0	87.5	100.0	112.8	125.0
	Complex	3.3	16.5	33.0	49.5	66.0	82.5	99.0	115.5	132.0	148.5	165.0

Page size: 8 1/2" x 10 1/2" or 8 1/2" x 11"

7A72